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ESOTERIC

ANTHROPOLOGY

(THE MYSTERIES OF MAN):

A COMPREHENSIVE AND CONFIDENTIAL TREATISE ON THE STRUCTURE, FUNCTIONS, PASSIONAL ATTRACTIONS, AND PERVERSIONS, TRUE AND FALSE PHYSICAL AND SOCIAL CONDITIONS, AND THE MOST INTIMATE RELATIONS OF MEN AND WOMEN.

ANATOMICAL, PHYSIOLOGICAL, PATHOLOGICAL, THERAPEUTICAL, AND OBSTETRICAL;

HYGIENIC AND HYDROPATHIC.

From the American Stereotype Edition, Revised and Rewritten

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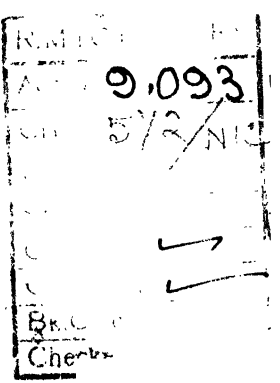

TO THE READER.

PREFACE TO THE AMERICAN EDITION.

I HAVE a few words to say in explanation of the motives, plan, and intention of this work; not to the public, but to the individual reader. I have no public to appeal to or propitiate; but only the person who now reads these words. They are written for him or her, and are intended to be *private and confidential.*

This is no book for the centre-table, the library shelf, or the counter of a bookseller. As its name imports, it is a *private treatise* on the most interesting and important subjects. It is of the nature of a STRICTLY CONFIDENTIAL PROFESSIONAL CONSULTATION BETWEEN PHYSICIAN AND PATIENT, in which the latter wishes to know all that can be of use to him, and all that the former is able and willing to teach. It is such a book as I would wish to put into the hands of every man and every woman —yes, and every youth wise enough to profit by its teachings— *and no others.*

Moreover, it is such a book as no one has yet written. We have ponderous works on anatomy, dry details of organism, buried in Greek and Latin technicalities, with no more life than the wired skeletons and dried preparations which they describe. We have elaborate works on physiology, and popular books on the same subject; the former are cumbrous, and incomprehensible to any but a professional reader; the latter are often meagre and shallow, and neither contain a clear philosophy of life and health. Within a few years there have been some earnest works written upon special subjects in physiology and pathology, which have been very useful; but I know of no comprehensive treatise

The books on some of the most important matters treated o in the following pages, are, for the most part, either the resul of an unscientific enthusiasm, leading to great errors, or a morbi pruriency of imagination, or devices of the most unscrupulou quackery. Of this latter class, there are scores of books, eac containing a portion of truth, but each full of errors, and eac intended to make money directly by their sale, and still more t bring practice in some special line of medical or surgical quack ery. It is a distinctive feature of this class of works, that i every few pages will be found a tempting bait for a personal con sultation, or a course of treatment. And this is the design o nine-tenths of all the medical books now published.

I write from other motives, and for other purposes. I write not to get consultations, but to prevent their necessity; not t attract patients, but to keep them away; and to enable them t get health without my further care. I wish to make this book so full, so clear, so thorough, and complete, that every one may understand the structure and functions of his system, the conditions of health, the causes of disease, and all the modes and processes of cure. It is a book for the prevention of disease; for the preservation of health; and, as far as that end can be attained, for its restoration. Having faithfully and carefully written it, I shall have performed a part of my duty. I shall have done the work at once, and for all, instead of wasting my life in a thousand individual efforts. Henceforth, when a patient consults me, I shall say with honest old Abernethy, "Read my book!" I wish, as far as possible, to retire from practice; to devote my remaining years to the more congenial pursuit of education, literature, and social science. But, before I could do this, I felt that I had a great duty to perform. The following pages are the result of my endeavour to perform that duty.

As the material basis of all reform, and all progress of humanity toward its true destiny, the world wants health. Individuals are sick, communities are sick, nations are sick. The very earth is diseased. All must be cured together; but the work must begin with the individual. Every man who purifies and invigorates his own life, does something for the world. Every woman

who lives in the conditions of health, and avoids the causes of disease, helps the race; and if such persons combine their purified and invigorated lives in healthy offspring, they do a noble work for the redemption of universal humanity.

My heart glows with the thought that this book will be the means by which thousands of men and women may preserve health for themselves, and transmit it to whole generations of strong, wise, and happy beings; that it may be one of the instrumentalities of a real, physical redemption for mankind, out of which will be developed all moral excellence, intellectual elevation, social harmony, and individual and general happiness.

Its plan and method are the result of long reflection, and a desire to give just what was necessary to the design, and no more. That design is to give, as far as possible, either what does not exist in any other work, what lies buried in a mass of error, or hidden under scientific disguises, or what it is thought necessary to exclude from works intended for general circulation.

Finally, I rely upon the calm judgment of the reader, for whom this volume is prepared, and to whom it is expressly sent, at his or her own desire.

And now, my human brother or sister, all I ask of you is, that, with a clear mind, and a pure heart, a love of the truth, and a willingness to accept it, you read the following pages; and, so far as the teachings they contain commend themselves to your reason, that you follow them faithfully in a life of purity and devotion to the highest good. There are many things which may be contrary to your preconceived notions. Humanity lies prone under the errors of ages. The miseries of mankind are but the symptoms of its errors of thought and life. There is no disease without a cause, and the cause is closely related to the remedy.

The world is cursed by ERROR and DISCORD—it must be saved by TRUTH and LOVE.

PREFACE TO THE ENGLISH EDITION.

In 1853, near New York, in the second year of the American Hydropathic Institute, while giving daily lectures to a class of male and female students on Anatomy, Physiology, and Hydrotherapeutics, I found the need of such a manual of health as I wrote in the following pages, written for those I was then teaching, aided by Mrs. Nichols, some record of whose labours for health may be found in "A Woman's Work in Water Cure and Sanitary Education." This book soon found a very wide circulation. I believe fully a hundred thousand copies have been printed, and it has found its way to the most distant corners of the world. Large numbers have been brought to England.

Last year I received a letter from a missionary in the Fiji Islands, from which I copy a few sentences:—

"I bought 'Esoteric Anthropology' in Sidney when I was preparing to come down to these islands as a missionary, some years ago. That book I have found to be a most excellent companion in this out of the way place, and have many a time thanked you for it. Two years ago, I sent an order to America for another copy, that I might supply a friend with it, and received a new edition, called by a new title, 'The Mysteries of Man.' I am thoroughly satisfied with the book—but there is one point I write to ask you about, in which the last edition differs very materially from the first. In the portion concerning the treatment of natural labour, you say in the new edition:—'When the delivery is completed, I take the vagina syringe and throw a pint and a half of TEPID water,' &c. Now in the first edition, you recommend COLD water for that purpose, as also does Mrs. Nichols in her Experience [Woman's Work.] This is a very important point, and may mean life or death, I therefore write to ask you.

"Doctors are scarce in Fiji. Nearly two years ago, my wife was confined, and, as I was the doctor, monthly nurse, and

everything else, I followed the plan I thought best, and that was the plan of your 'Esoteric Anthropology.' All went on well, and I have spoken of your plan of treatment to my friends. Mrs. Nichols' writings are very valuable, particularly in a place like Fiji."

Naturally I was pleased with this letter, and naturally I was also very indignant at the alteration made in my book without consulting me, since it has passed beyond my control. I wrote to my Fiji friend that the water must be COLD; and I resolved that I would at the earliest possible moment prepare a thoroughly revised edition of my book in England, from which I would expurgate all the errors of twenty years ago, and into which I would put some truths I have learned since it was written.

"Esoteric Anthropology," though covering a portion of the same ground, yet varies widely from my recent work, "Human Physiology the Basis of Sanitary and Social Science." It treats more particularly of disease, and more practically of treatment—especially of the conditions and diseases of the reproductive system, and of gestation and childbirth. "Human Physiology" treats more of Social Science, and three of its six parts are devoted to matters which are but slightly touched in the Anthropology. One may therefore well be the sequel or companion of the other. I have honestly tried to make both of them thoroughly good and useful books, true in science, pure in morals, and containing the principles of the highest welfare of man and of humanity.

T. L. N

Aldwyn Tower, Malvern, England.
1873.

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ILLUS[illegible]TRATIONS.

ESOTERIC ANTHROPOLOGY.

CHAPTER I.

OF MAN AND HIS RELATIONS.

A MAN is an organised being, with the consciousness of existence, and of having certain faculties of thinking, feeling, and acting. By means of his senses, tastes, and attractions, he holds relations to the material universe and to other beings. Each man is the centre of his universe. All things relate to him. He is an egotist, in this sense, by the necessity of his nature. His first idea is of the consciousness of his own existence; and on this first thought all his knowledge depends.

When man studies his own organisation, physical and mental, he finds that he is made with relations of perfect fitness or harmony with nature. The world is full of beauty, and he has eyes adapted to see it, and faculties fitted to enjoy it. His ears are wonderfully adapted to all sounds and their harmonious combinations. His sense of smell is related to a thousand delightful odours. His taste finds exquisite gratification from the aliments best adapted to supply the waste of his system. His pervading sense of touch, modified in many organs, gives him a world of delights. We can realise the uses and pleasures of these senses, only by trying to fancy ourselves deprived of one or more of them.

As the senses, feelings, and faculties of man connect him with the universe, he cannot fail to perceive that his relation with that universe is, or should be,

harmonious, and that a beautiful harmony pervades all nature, marking it as a work of design.

From the evident harmonies of man and the universe, comes necessarily the idea of God, as the Creator, pervading intelligence or soul of this universe of matter and thought. And the idea, or belief in God, comes to man as irresistibly as the recognition of his own consciousness. We have thus three things existing: the individual man, the external nature with which he holds harmonious relations, and the Author of these harmonies of relation, and all things between which they subsist; that is, between *all* things; for nature, to be in harmony with man, must be in harmony with itself in all its parts.

Out of the harmony of these relations of God, nature and man, or the individual soul, comes the belief in immortality, which comes directly from a necessary harmony between desire or attraction, and the thing desired; for the eye is no more a proof of light, and the ear of sound, than the "longing after immortality" is a proof of its necessary existence. "Attraction," says a great philosopher, "is in proportion to destiny." God has not mocked man with desires never to be fulfilled, and an ideal never to be realised.

Man desires health, wealth, knowledge, love, happiness; let him only live in harmony with nature, and they are all his—and they can be his only in proportion as he lives in this harmony.

When man obeys the laws of his own being, he lives in harmony with nature.

When man is in harmony with nature, he is in harmony with God, the Author of all harmonies.

For a man to follow nature, to live according to physiological laws, or to obey God, is one and the same thing. In doing one he does the other. "For whether we eat or drink, or whatever we do, let us do all to the glory of God."

The Cause of causes, being infinite, is of necessity incomprehensible. We reason from effects to causes, and form some idea of a maker from what he has made. But we know too little of nature to form any definite or comprehensive idea of the Author of Nature. We know almost nothing of matter or force, or what we call the laws of nature. We do not know how or why a stone falls to the ground, or water runs, or the sun gives light and heat, or life exists on this and probably other planets. The more we know of nature, and especially of ourselves, the better is the idea we are able to form of the power, wisdom, and goodness of the Creator; aside, of course, from such revelation of his character and attributes as he has seen fit to give us.

Man, in his body and his soul, is a revelation of God; and in his developments, sexes, faculties, instincts, passions, and relations, is to be devoutly studied. If we would learn the will of God, we may find it here; but as man is, to a great extent, in a state of discordance with nature, we can only understand him rightly by studying him in his best conditions and most harmonious relations.

The First Cause must be self-existent, and therefore eternal and infinite, filling space and duration. Principles are self-existent. We cannot conceive of any time or place when a circle did not differ from a square, and the three angles of a triangle did not make two right angles.

Fourier, in his analysis of universals, defines the first principles of nature as —

1st. The active principle, or SPIRIT.

2nd. The passive principle, or MATTER.

3rd. The neuter principle, or MATHEMATICS.

Equivalent to God, universe, laws.

In this work, we have to consider man as an organised being, possessing certain faculties and passions, and the

relations he sustains, through these, to nature and to his fellow-beings.

Health is the result of the integrity of a good organisation, and the harmony of true relations.

Disease is the consequence of the reverse of both these conditions.

The law of universal analogy connects man with the universe. His life depends upon light, heat, and other elements or forces, generated in the sun, a body nearly a hundred millions of miles distant, but to which man and the earth are so united, that the least change in the centre of the solar system instantly affects every planet, and every thing they contain. Man stands at the apex of the visible creation. In him matter, and force, and life, have their highest expressions, and it is for this reason that human physiology is a central or pivotal science. On it is based a knowledge of God and his laws; the universe and its divine harmonies; man and his destiny, social and individual.

We shall see that the subject of HEALTH relates to all these; that the causes of DISEASE are in the discordances of man and nature, and that the conditions of health belong to the harmonies of the universe.

The fully developed man, of the highest type with which we are acquainted, is a beautiful and majestic animal, six feet high, walking erect on two legs; with an oval-shaped head, balanced upon a perpendicular spinal column; with two arms, furnished with prehensile organs of a curious and complex structure. He has a soft, smooth skin, of a rosy white colour, and fine hair grows upon the head, chin, and around the virile organs.

The female of this animal is commonly shorter than the male, more delicately formed, with longer hair upon the head, and none on the face; with smoothly rounded limbs tapering to smaller hands and feet; with narrower shoulders, wider hips, and a beautiful bosom.

The sexes differ in mental and moral qualities, as much as and corresponding to the differences in bodily organisation. There is sex in mind and soul.

Man is gregarious in his habits, the love of society being one of his strongest instincts. He builds houses and other structures of use and ornament; makes arms, clothing, and means of artificial locomotion; subdues other animals to his service; has an articulate and written language; produces music by his own natural organs, and by instruments he has invented; forms statues and pictures; prepares food by fire, and in a thousand ways shows himself widely different in his nature and faculties, and therefore in his destiny, from all other animals.

Many animals possess remarkable faculties, and several of those we have mentioned as belonging to man. Bees have mathematical skill, some kind of language, great industry, and a limited power of adapting themselves to circumstances. In birds there is often seen great mechanical power, and fervour of feeling. In the mammalia--the dog, the beaver, the horse, and the elephant, we have limited reasoning powers, and some high moral attributes. But all animals have either no power of progress, or a very limited educability. Man alone seems capable of infinite progression, and of an intellectual and moral development of the extent of which we have probably very inadequate conceptions. He alone is free, with choice of good and evil, and therefore moral accountability. His capacity for improvement is a capacity for perversion and depravation. God could not give him the power of progression without also giving him liberty of action; and liberty implies the power of doing wrong. Man could not have had the power of being sublimely great and happy, without the liability to become degraded and miserable. In order to do good, he must have been made at liberty to do evil; and that he might feel the glorious

satisfaction of doing right, it was necessary that he should have the dangerous faculty of doing wrong.

But however degraded and depraved man may become, there is no doubt of his immense superiority to all animals; we find his nature more complicated in its details, more numerous in its parts, more exquisite in its formation, and more admirable in its adaptations, than any of the wonders of nature around us. We must compare man with other organised beings, to do full justice to the wisdom and beneficence displayed in his structure, functions, and capabilities for happiness.

Happiness, enjoyment, pleasure, or whatever word may express our sense of the natural and harmonious action and gratification of the human passions, appears to be the single end or final cause of creation. We are unable to conceive of any other motive. Every faculty is for use, every organ has its function, and every function gives, or in some way contributes to, enjoyment. Nothing is made in vain. Every thing in man and out of him, is the result of infinite wisdom, joined to an infinite love; and therefore all tends to one single purpose, the greatest possible happiness of all beings.

We are to study the organisation of man, therefore, with a constant reference to its adaptation to happy uses, and we shall find that he has no organ, structure, or tissue, which is not marked with the design of a great artist, who had a special and benevolent motive in making man, and the wisdom and power to accomplish that design. In this study, we cannot go one step without faith in God, and an acceptance of His manifestation to our consciousness. Every one must accept what commends itself to his reason as true, or in harmony with his conscious being.

When we contemplate any phenomenon, we wish to understand the cause. "What does it?" is a spontaneous question. This inquiry of causation leads directly to the cognition of the Great Cause of causes.

CHAPTER II.

THE CHEMISTRY OF MAN.

I WISH to make a few observations on the chemistry of man, before entering upon his physiology.

As a material being, man is subject to the laws of matter. Fire burns his body, acid corrodes it, and when, in the language of poetry, "the vital spark has fled," this matter becomes subject to the processes of putrefactive decomposition. The matter of which the body is composed returns to its primitive elements, or enters into new forms of organic matter.

Chemistry treats of the elements of matter, and their relations, combinations, and changes. An elementary body is one which the chemists have not been able to separate into simpler elements. There are now reckoned over fifty of these elements, all but a few being metals, and many found in small quantities, and having, so far as we now know, but little importance. The most important so-called elementary bodies—for chemists do not despair of resolving many of them into simpler forms—are iron, copper, gold, silver, zinc, tin, mercury, etc., among the metals; aluminum, potassium, sodium, calcium, silicon, etc., among the metallic bases of the earths and alkalies; oxygen, hydrogen, nitrogen, chlorine, etc., among the gases; and carbon, sulphur, phosphorus, etc., among the peculiar bodies, not otherwise classified.

The metals found in the human body are—*iron*, which gives its colour to blood; *sodium*, which, united with chlorine, forms common salt; *potassium*, which exists in minute quantities as potash; *calcium*, the metallic basis of lime, which forms the hard structure of bones and teeth; and *magnesium*, *silicon*, the basis

of sand, rock crystal; *alluminum*, the basis of clay, slate, etc., and some other metals are sometimes found in minute quantities.

Oxygen is one of the most important and universally diffused of all the elements. It composes one-fifth of the atmosphere; one-third by measure, and seven-eighths by weight of water, and combines with metals and other elements, to form a vast variety of substances. Some of these combinations are called oxides, some acids, some alkalies. Oxygen is the chief supporter of combustion, which is but another name for oxydation. This process is accompanied by the evolution of heat, and, under some circumstances, of light. It is the grand element of all organic life, and is believed to be the chief agent in all vital operations.

Hydrogen is the lightest of the gases, and combines with oxygen to form water. As water is a large component of all organised bodies, and pervades earth and the atmosphere, we have in nature an abundant supply of hydrogen. United with oxygen, it produces flame, and the result of such union is water.

Nitrogen forms four-fifths of the atmosphere, and is an important constituent of vegetable and animal tissues, helping to form albumen and fibrin, both vegetable and animal. United with hydrogen, it forms ammonia; combined with oxygen, chemically, it forms nitric acid.

Carbon exists in nature, as charcoal, mineral coal, and is crystallised in the diamond. It is the chief constituent of woody fibre, oil, starch, sugar, alcohol, and enters largely into all vegetable and animal substances. Combining with oxygen, it forms carbonic acid gas—a heavy irrespirable fluid, in which men drown, as if under water. Carbon is constantly separated from the blood by the lungs, liver, and skin. Combining with oxygen, it furnishes animal heat, and the result is car-

bonic acid. Hence the necessity for constant ventilation. Carbonic acid is also produced by fires, the burning of lamps or candles, and in most cases in which carbon combines with oxygen. The result of their rapid union is the disengagement of intense light and heat.

Sulphur is a peculiar and familiar substance, which unites readily with oxygen, burns, and forms sulphuric acid. It is found in vegetables, and is thence carried into the blood and muscular tissues of animals. From the combination of sulphur and oxygen (sulphuric acid) with various bases, we have the sulphates of soda, magnesia, iron, zinc, etc.

Phosphorus is something like sulphur, but much more inflammable—that is, it unites more readily with oxygen at low temperatures. In this union it forms phosphoric acid. This combines with calcium, and forms phosphate of lime; and this, existing in wheat and other vegetables, makes part of the blood of animals, and is found especially in the bones.

All matter, whether solid, liquid, or gaseous, is composed of ultimate atoms, inconceivably minute, as the microscope everywhere reveals to us; as the smallest animalcule is composed of parts formed from a combination of a vast multitude of such atoms. These atoms have their own determinate form, size, weight, motions, attractions, repulsions, and peculiar powers of whatever kind.

Two or more atoms of simple elements uniting, according to laws of definite proportions, form the molecule of the composed body. Thus, one atom of oxygen, uniting with one atom of hydrogen, forms one molecule of water, and they can only so unite in these fixed proportions. One atom of nitrogen, uniting with five atoms of oxygen, forms nitric acid, and so on.

No two atoms of matter can ever, by any possibility, come in contact with each other. This is a fact which

I have not space here to prove, but which is perfectly demonstrable. No two atoms of diamond, or gold, or water, or air, ever can touch each other. They are held in a certain nearness by their attractions, but forever kept asunder by their repulsions. Each one is an independent individual atom, but holding social relations with the atoms around it.

The distances of these atoms from each other, and their relative positions, change continually with variations of temperature. Thus, a hard body expands and contracts with every variation of heat and cold—that is, each of its atoms goes farther from or approaches nearer to its neighbours. With the increase of heat, their repulsion increases, until they break apart, and the solid becomes a liquid; with a still further increase of temperature, the liquid becomes a vapour.

The same kinds of elementary atoms may combine in the same proportions, producing various results, depending, not upon their nature or proportions, but upon some form of combination. Thus, the fœtid gas from the gas-works, and the beautiful perfume, otto of roses, are composed of exactly the same elements, combined in exactly the same proportions. The ingenious reader will soon be surprised to find how nearly alike are the chemical ingredients of all animal substances.

All forms of matter exist in virtue of certain laws, under which they maintain their conditions and identities. As long as certain attractions and repulsions exist, in a certain relation of intensity, there is no change; but change conditions, and the atoms instantly assume new relations and new forms. With the simple addition of caloric, ice becomes water, and water steam; with the abstraction of caloric, steam is condensed to water, and water solidifies. Under a similar rise of temperature, the solid substance gunpowder, or gun-cotton, assumes instantly a gaseous form, and the

added repulsion of its atoms acts with tremendous and destructive force.

So, if we bring the element of electricity, in the form of galvanism, to act upon water, we disturb the attractions of the atoms of oxygen and hydrogen for each other. The oxygen obeys a stronger attraction, and goes to one pole of the battery, while hydrogen rises from the other. And such, in some way, is the condition of all compositions and decompositions; and similar laws, founded on a system of universal analogy, run through the whole universe of matter and of mind. Every atom of matter, and every human soul, left in freedom, follows its strongest attraction.

Of the great number of substances reckoned elementary, many enter into the complex combinations of the organic world, but there are only a few which seem necessary. The rest are occasional or accidental. Thus, in the vegetable kingdom, we have carbon, oxygen, hydrogen, and, in less quantities, nitrogen. The three first are the principal constituents, the fourth is always present; and a variety of others, as soda, potash, lime, iron, sulphur, phosphorus, etc., may be present in varying proportions.

Animals are made up of the elements existing in vegetables. There is no other source except the two compound elements, air and water. Man can only have what these can give him. In all the phenomena around us, we have only changes of form and relation. Men consume the flesh of animals, but this is only taking vegetable elements at second hand.

The proximate constituents of the animal body are divided into two classes, the *mineral* and *organic*.

We may divide the mineral into the physically useful, the chemically useful, and the merely incidental.

The constituents useful by their physical properties are:

1. Water, composed of hydrogen and oxygen, and

which is, therefore, an oxide of hydrogen; and if hydrogen be considered a metal, water is a mineral. Water constitutes about nine-tenths of the body by weight. It pervades every tissue. A beefsteak, as it comes from the market, contains about 70 per cent. of water. The blood and nervous matter are nearly all water. Man begins his existence as a microscopic vesicle of almost pure and transparent water.

2. Phosphate of lime comes next to water among the mineral constituents of our bodies, in quantity and use. It forms most of the solid matter of bone, and is found also in blood, from which the bone is made, in milk, and also in the urine and fœces, by which its waste and surplus is expelled.

3. Carbonate of lime, which forms the shells of fish, snails, etc., is also found in small proportions in the bones of the higher animals and man.

4. Phosphate of magnesia also unites with the phosphate of lime, though in minute proportions.

Of chemically useful constituents, we have:

1. Hydrochloric acid, one of the constituents of common salt, from which it is obtained, in the digestive fluid.

2. Chloride of sodium, or common salt, in the blood, gastric juice, bone, urine, tears.

3. Carbonate of soda, found in animal ashes.

4. Phosphate of soda, in blood, lymph, bile, etc.

5. Iron in the colouring matter of blood, hair, black pigment of the eye, etc.

The incidental constituents are chloride of potassium, alkaline sulphates, carbonate of magnesia, manganese, silica, allumina, arsenic, copper, mercury, lead, etc.

The organic constituents are divided into two groups; those which contain nitrogen, and those which are destitute of that element.

Protein is a name given to the nitrogenised substance which, under various forms, enters into the composition

of the most important animal tissues. It is albumen in the white of an egg, in the serum of the blood, and many of the secretions; fibrine in the fibrous portion of the blood, in membrane, muscle, and areolar tissue; and casein in milk. All these are composed of the same ultimate elements, viz., carbon, oxygen, hydrogen, and nitrogen, united in the same proportions.

Fibrine, casein, and albumen, all exist in vegetables, and are identically the same in them as in the animal tissues. So far as nutrition is concerned, it makes no difference whether we eat vegetable food or animal, only that it is purest at first hand, while the flesh of animals is always more or less tainted with disease or diseasing impurities.

The same ultimate elements enter into the composition of gelatine, the basis of bones, cartilages, sinew, ligament, skin, etc., and the chemical bases of saliva, the gastric juice, bile, and are found in pus, urine, and other excretions.

The animal sugars, fats, and acids are composed of carbon, oxygen, and hydrogen, but contain no nitrogen. They differ but slightly from similar vegetable productions.

As the blood contains all the proximate principles that enter into the human body, its analysis will show of what that body is composed.

Healthy human blood contains, in 1000 parts:

Water	790·0	Cruorin†	1·0
Fibrine	0·9	Carbonate of soda	1·0
Albumen	54·0	Chloride of sodium (salt)	4·0
Hæmatin*	133·4	Chloride of potassium	2·0
Oxide of iron	0·7	Phosphates of lime and magnesia	0·5
Phosphorised fat	8·2		
Carbonate of lime	1·3		

The blood also contains sulphur, phosphorus, and

* Colouring matter of the blood globules.

† A protein compound resulting from albumen and fibrin.

occasionally several other substances not given in this analysis.

Human milk, being secreted from the blood, and again converted into it, gives a similar result. In 1000 parts:

Water	883·6	Casein (cheese)	34·3
Butter	25·3	Sugar of milk, etc.	48·1
	Salts	2·3	

Cow's milk, the most commonly used for food, may be compared with the above by the following analysis. In 1000 parts:

Water	821·8	Casein	67·0
Butter	55·0	Sugar, etc.	51·0
	Salts, etc.	13·0	

The atomic composition of the proteian compounds albumen, fibrine, and casein, is carbon, 40; hydrogen, 31; nitrogen, 5; oxygen, 12; or by Liebig's formulary, C 48, H 36, N 6, O 14.

Crystals of the sugar of milk contain carbon, 12; hydrogen, 12; oxygen, 12.

The animal fats and acids are composed of these three elements, as are the vegetable oils, starch, sugar, and acids.

By certain changes in the arrangement of the atoms, and sometimes in their proportions, we have starch converted into sugar, fat, alcohol, acid. Sugar is converted readily into fat by the digestive process, and into alcohol and acid by fermentation.

Thus we have the three elements, carbon, hydrogen, and oxygen, composing the heat-giving principles, in our food, and nitrogen added to form the animal tissues.

Much of what is stated here will seem more clear and important, when it is applied to physiology, in what is to follow.

CHAPTER III.

HUMAN ANATOMY.

THE human body, viewed outwardly, is composed of a head, neck, trunk, two superior extremities, and two inferior. Standing before you, facing, or the reverse, a line down the centre divides it into two equal and symmetrical portions. This is the case with the body, as a whole, but is not the fact respecting the internal organs, which are not symmetrical, or cannot be divided into two equal halves. But the bones are either symmetrical, or in pairs, and so are all the muscles of the system of voluntary and instinctive motion.

The trunk contains three cavities: the upper, the chest or thorax; the middle, the abdomen; and the lower, the pelvis. The thorax contains the heart and lungs; the abdomen contains the stomach, intestines, liver, spleen, pancreas, kidneys; the pelvis contains the bladder, rectum, the ovaries, uterus, and vagina in women, and the seminal vesicles and prostate gland in men. In the latter, the most important generative organs are external.

The head is divided into two parts; the face, which forms a small angle of its anterior inferior portion, and the cranium, an oval box of bone, filled with the brain, a prolongation of which extends about three fourths of the length of the back-bone, or vertebral column, and branches or fibres from which are sent off to every part of the body.

The whole body is made up of several systems of organs or tissues, which enter into every part of its structure. Thus we have—

1. A bony skeleton, or frame-work of two hundred and forty bones, with their cartilages and ligaments, giving it form, solidity, and power of motion.

2. A muscular system, consisting of four hundred muscles with their tendons, by which all motions are performed, and extending over the whole system make a large portion of its bulk.

3. An areolar or cellular system, composed of fine interwoven fibres, making the sheaths of vessels, muscles, nerves, and forming the parenchyma, or connecting substance of various organs. It is in, or upon this tissue, that the fat cells are deposited.

4. The arterial system, by which the blood is carried from the heart to every part of the system, supplying bones, muscles, nerves, skin, membrane, etc., with the vital fluid which sustains them all, and repairs their hourly waste. The ramifications of the arteries are inconceivably minute. The point of the finest needle pierces hundreds of blood-tubes, the moment it penetrates the true skin.

5. And wherever the blood is carried by the arteries, it must return by the veins; so that we have a venous system, as vast and pervading as the arterial.

6. A portion of the blood, believed to be the finest and most highly vitalised, is returned to the heart, from every part of the system, by another system of vessels, or tubes, called lymphatics; these form a net-work over the whole body, and penetrate to every part of it.

7. The nervous matter connected with the brain, is also distributed to every part of the system, so that the needle which draws blood by piercing microscopic veins and arteries, also gives exquisite pain, by wounding the delicate fibres of the nerves of sensation.

8. As the nerves of the ganglionic system, called nerves of organic life, accompany the blood-vessels in their minutest ramifications, these nerves must equally pervade the whole organisation.

Here, then, we have eight pervading systems, each of which extends to the entire body, and most of which

would preserve its entire and perfect form, if deprived of all the others.

Among the extensive and important tissues of the human body, we must not omit the external skin, which lines the whole surface of the body; the internal skin, or mucous membrane, which lines its interior parts, which are connected with external apertures; and the serous membranes, which line the shut cavities, and are folded around the most important organs.

All these tissues and organs we must briefly consider.

Bone is composed of nearly equal parts of cartilage (gristle) and earthy matter. The cartilage is first formed, and then the earthy matter is deposited. Each is deposited by the blood, which contains in itself the materials of every tissue and every secretion. Bone is an organised, living structure, pierced by blood-vessels and nerves, subject to waste, and requiring renewal, liable to fracture and disease, and demanding reparation. Seemingly solid, it is very porous, so that a piece of bone has been compared to a heap of empty boxes, thrown loosely together.

Bones are long, as the arm and thigh bones; cuboidal, as those of the wrist and instep; or flat, as the shoulder-blades and skull bones. They are joined closely and immovably, by sutures, or a sort of dove-tailing; by symphisis, as in cartilaginous joinings; or by movable joints, as those of the shoulder and hip. There are ball and socket-joints, allowing the bone to be moved in all directions, as the thigh and shoulder joints, while the elbow, knee, ankle, and other joints are called hinge-joints, allowing only of the simple movements of flexion and extension.

The ends of the bones have a covering of cartilage, and the joints are firmly bound together, and curiously strengthened by ligaments. If the best artist or mechanician in the world were to exert his ingenuity a

thousand years, he could discover no better method of making a skeleton.

The bony structure of the head is very complicated. There are eight bones in the cranium, and fourteen in the face. The former are mostly flat, and inclose the brain, to which they offer an admirable protection; the latter are of various irregular shapes, forming the nose, jaws, orbit of the eye, roof of the mouth, etc.

Fig. 1.—Cranium.

The head rests on the spinal column, which is composed of seven cervical, or neck vertebræ, twelve dorsal, or back, and five lumbar, or those of the lower part of the back. This column, which increases in size from above downward, rests, at its base, upon the sacrum, a wedge-like bone which forms the keystone of an arch, made by the bones of the pelvis, which, in their turn, rest upon the thigh-bones, and these again on the bones of the legs and feet. Twelve ribs on each side are attached to the dorsal vertebræ; these curve round in front, and by cartilaginous connections with the sternum or breast-bone, form the bony case of the thorax, and protect the heart and lungs. The arms are joined to the body loosely, by means of movable shoulder-blades, which are kept in place by muscles, and by means of the collar-bone.

The points about the bony skeleton most worthy of notice, are:

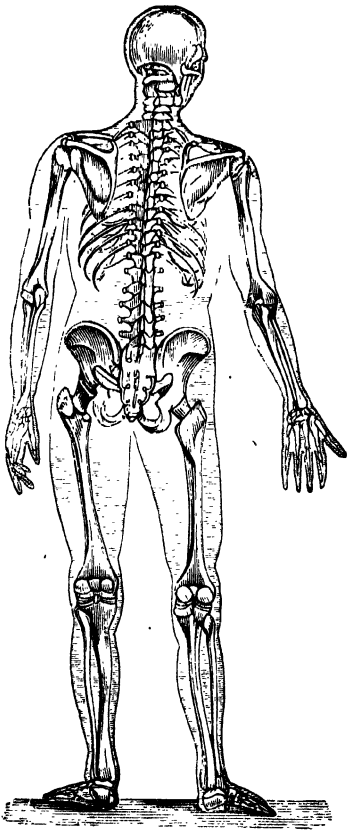

Fig. 2.—Full Length Figure showing Bony Skeleton.

Fig. 3.—Pronators of the Fore-Arm.

The protection of the brain by the eight bones of the cranium; those on the surface being formed of two plates with a sponge-like layer of bone between, so as to give the delicate internal organs protection from external injuries.

The strong and flexible backbone, and its protection of the spinal marrow, or extension of the brain; so formed as to sustain an immense weight, to bend easily in every direction, and to afford points of attachment for hundreds of muscles.

The coat-of-mail-like, movable thorax, formed of the dorsal vertebræ, ribs, and sternum, which expands and contracts in dimensions in rising and falling.

The bony pelvis, strong to support the weight of the body, and so formed as to sustain and protect its contents; and in the female larger than in the male, to allow the birth of a full-grown fœtus.

The rolling articulations of the two bones of the fore-arm, allowing the hand to be turned in every direction, and the combination of small bones, forming the flexible joint of the wrist, and the flexible arch of the foot.

The bones are soft and flexible in infancy, hard and brittle in old age. When broken, they are usually repaired in five or six weeks by the deposition of new bony matter from the blood. But where pieces are taken from the skull, they are replaced by dense membrane; and under the capsular ligament, at the hip joint, and in states of disease, they often refuse to unite.

A muscle is a bundle of very minute fibres, each contained in a separate sheath, and each having the property of contracting under the nervous stimulus. As the whole muscle contracts, by the contraction of its fibres, contracting in its length, and expanding in its circumference, it draws the parts to which it is attached together with a power in proportion to the size of the muscle and the stimulating force applied.

The nervous power has, in fact, more to do with the force exerted than the strength of the muscle; and the force of contraction is often much greater than its own power of cohesion. The contraction or drawing together of the particles or disks, of which the ultimate fibres of a muscle are composed, under the nervous influence, resembles the development of the magnetic attraction in pieces of iron under the galvanic current.

The sheaths of the muscular fibres seem to unite together, to form the tendons by which they act on distant parts, when compactness is wanted for use and beauty, as in the wrist and ankle.

The head alone has seventy-seven muscles. There are eight for the eyes and eyelids. The eyeball has four straight muscles, one above, below, and on each side, and two oblique, to give it a rolling motion. One of these, before it is attached to the eye, passes

Fig. 4.—Muscular Fibre, dividing into fibrillæ, magnified 300 diameters.

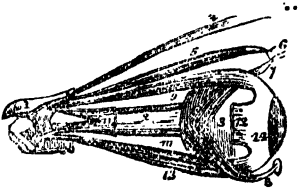

Fig. 5.—Muscles of the Eyeball, from outer side of right orbit.

through a pulley, to change the direction of its action. There are eight muscles for the lips, eight for the jaw, eleven for the tongue, seventeen for the motions of the head and neck; and it is by the variously combined action of these that we have all our movements and expressions. There are seventeen muscles for the movements of the chest, abdomen, and loins. These perform, among others, the important function of res-

piration. The cavity of the chest is enlarged some eighteen times a minute, by raising the ribs and sternum, and still more by straightening or drawing down the diaphragm, or muscular separation between the thorax and abdomen. When this is done, the air rushes into the lungs, to prevent the vacuum that would otherwise be formed. Next, the three sheets of abdominal muscles contract, force up the diaphragm, draw down the ribs, and forcibly expel the air: and this action is kept up, night and day, sleeping and waking, from the moment of birth till death; while the heart, a muscular organ, contracts four times as often during the same period. The whole body of man, in all its parts and organs, is, during all this time, the scene of various and constant action.

Fig. 6.—Muscular System.

Muscles are organs of voluntary or involuntary, conscious or unconscious, motion. We have no direct control over the heart, or the muscular fibres of the stomach, intestines, bladder, uterus. We can govern somewhat those of respiration. The muscles of swallowing are involuntary. When a morsel of food is pressed back by the tongue beyond the fauces, it is seized,

and by a series of involuntary contractions, carried into the stomach.

The largest and strongest muscles are the extensors of the lower extremities, and the flexors of the upper. Thus we have large masses of muscle on the back of the leg, forming the calf, to extend the foot; on the front of the thigh, to straighten the knee-joint, and again on the posterior portion of the pelvis, to extend the thigh. Much of the beauty of the human form depends upon this muscular arrangement.

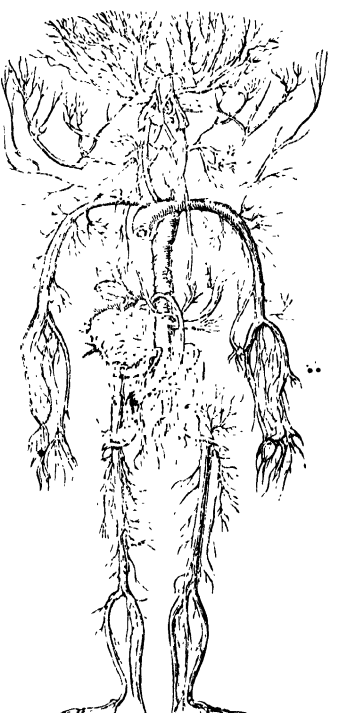

Fig. 7.—Arterial System.

The bones and muscles give form and locomotion, and the whole body is a means for the manifestation and enjoyment of the soul, whose especial organ is the brain. This brain, in which resides the conscious ME, the individual, is carried about, protected, nourished, and variously ministered to by its bodily organs, to which, in turn, it distributes vital energies. In dis-

ease, there is discordance between brain and body—in insanity, the discord is in the brain.

OF THE BLOOD VESSELS.

The necessity for the constant nourishment of the whole body, growing out of a constant waste of matter by its activity, makes needful a vast system of tubes by which the blood may be carried everywhere, and returned again to the centre of circulation.

We have in the centre of the thorax a heart, consisting of two parts, right and left, each having two cavities, an auricle and ventricle. The heart is simply two force-pumps, joined together for convenience. In some of the lower animals, as fishes, there is but a single pump—in reptiles, there are three chambers. Each pump is furnished with beautiful valves, which allow the current of blood to go on, but prevent its return. These valves work constantly for more than a hundred years in some cases, without getting out of order.

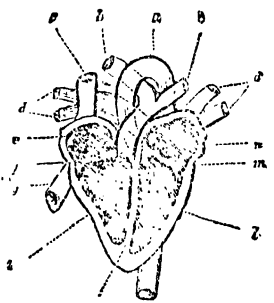

Fig. 8.—The Heart.*

The blood, as it comes from all parts of the system, by the veins, is received into the right auricle, or receptacle, of the heart, from which, by a muscular contraction, it is sent into the right ventricle. The right ventricle contracts, and throws the blood it contains

* Ideal section of mammalian heart. *a*, arch of aorta; *b*, *b'*, pulmonary arteries; *c*, superior vena cava; *d*, *d'*, pulmonary veins; *e*, right auricle; *f*, tricuspid valves; *g*, inferior vena cava; *h*, right ventricle; *i*, septum ventriculorum; *k*, descending aorta; *l*, left ventricle; *m*, mitral valve; *n*, left auricle.

through the pulmonary artery into the lungs, where it is purified and changed in its colour and qualities. This is the action of the right pump. The blood now goes back by the pulmonary veins to the *left* auricle, thence into the left ventricle; which, contracting, forces it into the great aorta, and so on over the whole body. These two pumps act together. Two auricles contract, then the two ventricles; one pump supplies the lungs, and one the whole body. The right, or lung pump, receives the blood from the body; the left, or body pump, receives it from the lungs.

As there are about twenty-five pounds of blood in the body, and as the heart sends on about two ounces at each pulsation, at the rate of say seventy a minute, it is easy to estimate the time it takes for the whole quantity to circulate. But some portions, having farther to go than others, must get round slower. The living blood is the pabulum of life to all parts of the system. It is constantly distributing their substance to bone, muscle, brain, nerve, etc., constantly sending off secretions and excretions, and it must also receive regularly new supplies of matter, prepared from our food, by the processes of digestion. How important that this blood be pure! that our food be natural, and our digestion well performed!

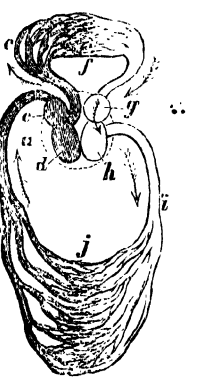

Fig. 9.—Circulation.*

* Ideal view of the course of the circulation. *a*, incloses the four chambers of the heart; *b*, veins bringing dark blood to *c*, right auricle; *d*, right ventricle; *e*, pulmonary artery; *f*, beginning of pulmonary vein conveying the arterialized blood to *g*, left auricle, *h*, left ventricle; *i*, arteries. The arrows show the direction of the current.

From the great aorta which curves over the heart, and then passes down, near the spine, go off branches to the head and brain, the arms, the internal organs, the lower extremities—in a word, to every portion of the body. These branch off, finer and finer, until at last we come to a system of capillaries, or hair-like tubes, of such extreme minuteness, that they can only be seen by microscopes of the highest powers—so fine, that the red globules of blood, which are only the five thousandth part of an inch in diameter, can no longer pass through them, and only the smaller white globules, and finally, the liquid serum alone can find admission.

By this means, blood is everywhere supplied, in just the quantity required. We have it when we want it, where we want it, and as much as we want. In sensitive and active organs, there are many and large arteries, and abundant capillaries, and the supply is active. Thus, four large arteries go to the brain, which receives a large portion, not all. But the heart, a beautiful mechanical contrivance—the most perfect of forcing-pumps—can only send the blood, with a certain force, estimated at fifty pounds, into the main artery. It cannot influence the distribution to one of its branches. It can send it faster or slower, and with more force or less; but this is all. It cannot send blood where it is specially wanted. It cannot send it one hour to the brain, producing active thought and vivid emotions, and the next hour to the stomach, to aid in digestion, and the next to the organs of generation. The heart does not direct the blood to the pregnant uterus, to nourish the growing germ, nor to the broken leg, to furnish a supply of bony matter.

For all this, some other power is needed; a power guided by intelligence, a power which acts upon the nervous system, and which is intimately related to the power of life. Who can comprehend this power which

resides in vegetables, in all animals, and supremely in man?

As the blood is sent with a vigorous impetus, from the left ventricle of the heart, through a system of dense, tough, cylindrical tubes, called arteries, over the whole body, by the branchings and ramifications of these vessels, and the networks they everywhere form with each other, until the great branching tree or vine expands to millions of twigs and hair-line tubes of microscopic fineness; so, in order that this same blood may be carried back to the heart, there must be other sets of minute tubes, venous radicles, gradually uniting and enlarging, until the blood is poured through two great tubes, ascending and descending, into the right auricle. Both arteries and veins have the power of expansion and contraction, and do expand to accommodate unusual quantities of blood, and do contract, to force their contents onward to their destination. The large

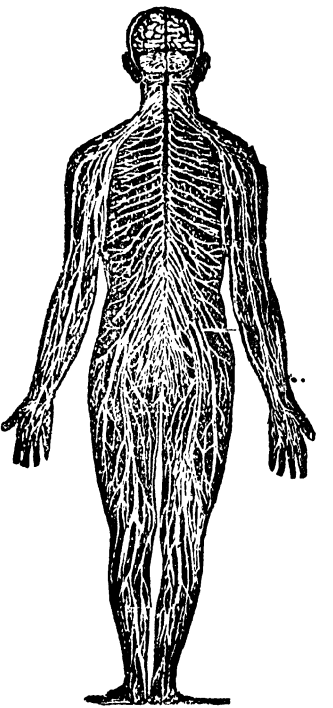

Fig. 10.— Nervous System.

veins generally follow the course of the arteries. In many parts, there are two veins accompanying one artery; but there are also many veins which are external, lying directly beneath the skin, and they are so distributed over the surface, probably, that the venous blood may have the influence of air and light. The larger veins in the lower extremities are provided with numerous valves, to prevent the blood being forced back upon the capillaries by its own weight, or by muscular pressure.

The blood is sent back to the heart through the veins, by capillary action, and this action continues after the heart has ceased to act, so that the arteries are commonly found entirely emptied of blood, and filled with air, while all the blood in the body is found in the distended veins. This proves that the action of the heart has no more to do with the circulation of the blood than to throw it within reach of the capillaries, which have a circulating power of their own. In fact, trees and all plants circulate their juices without a heart, and so do many of the lower orders of animals.

Diffused over the whole body, and penetrating all its organs, is a third set of tubes, small, transparent, furnished with valves at short intervals, and entering and emerging from little knots, or gangha, or glands, which are scattered over the body, but which are found, in large numbers, on the sides of the neck, in the armpits, the groins, and upon the mesenteric folds of the intestines. These tubes convey white blood, or lymph, from every part of the system to the descending vena cava, where it mixes with the current of venous blood, returning to the heart.

But the lymphatics of the intestines are called lacteals, and convey a portion of the nutriment elaborated by digestion through the thoracic duct to the same destination. The anatomy of these vessels has been

but lately understood, and their physiology is little known.

THE BRAIN AND NERVES.

The hollow of the skull, from the top of the head down to a line formed by the base of the orbit of the eye, the opening of the ear, and the top of the back of the neck, and in its entire breadth, is completely filled with a pulpy mass, grey without, and of a pearly white within, called the brain. It is divided into a large anterior and superior portion, the cerebrum, and a smaller posterior and inferior portion, called the cerebellum; in the centre, between these, a prolongation of the brain, containing fibres from both, passes down into the hollow of the vertebral column. The portion within the skull is the medulla oblongata: the remainder is the spinal cord. It is about half an inch in diameter, and, like the brain, is composed of both grey and white matter, and its different parts have distinct functions. Brain

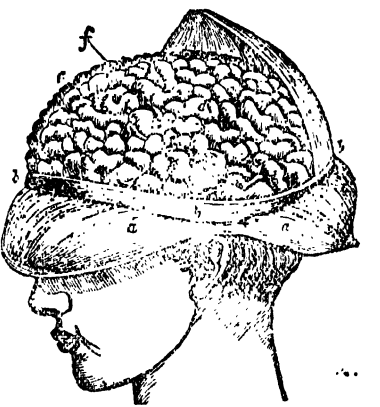

Fig. 11.—The Brain Exposed.

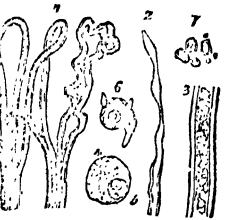

Fig. 12.—Minute Nervous Structure.

and spinal cord are divided into two equal halves by the median line, so that all its organs and nerves are in pairs, and one side may be diseased or paralyzed, while the other is comparatively healthy and active.

The cerebrum is believed to be the organ of sensation, thought, and most of the sentiments and propensities or passions. The cerebellum seems to preside over muscular motion, and is believed by phrenologists to be the organ of amativeness which presides over the generative function. The propensities or instincts, which we possess in common with the lower animals, are found in the lower portion of the brain; the higher faculties, and those peculiar to man, are found in the upper portion. Generally the forehead is intellectual; the top of the head, moral and religious; the side, worldly; the lower and back, passional and selfish. The lower organs connect us with the physical, the higher with the spiritual; and all acting together make up a harmonious being.

The outer grey matter of the brain is composed of cells of microscopic minuteness; the white matter consists of tubes, filled with a still softer substance. All these cells, tubes, etc., are of inconceivable minuteness.

The brain, as the true centre of conscious life, and the special residence of the soul, holds constant communication with every part of the body, and through the five senses with the external world. A pair of olfactory nerves, distributed over the lining membrane of the nose, carries to the brain an impression of odours; the optic nerves, expanded upon the internal chamber of the eye, are impressed with pictures of objects; the auditory nerve, curiously extended through the apparatus of hearing, receives and conveys impressions of sound; the gustatory nerves give us all ideas of savours; and nerves of sensation or touch go off to every portion of the body, especially to the whole surface and its

more sensitive portions. Nerves of motion are also sent off in pairs from the brain and spinal cord to every muscle in the body.

The distribution of nervous fibres is as minute as that of the blood-vessels; and if we reckon the nerves of organic life, it is much more so. Yet the nerves are everywhere nourished by the blood, as the blood is everywhere controlled by the nerves. Blood is formed under the nervous influence, and nerve matter is continually furnished by the blood. Which is first? If either, it is the highest, the nerve. The spinal cord is the first part seen; the brain expands at the end of the spinal cord.

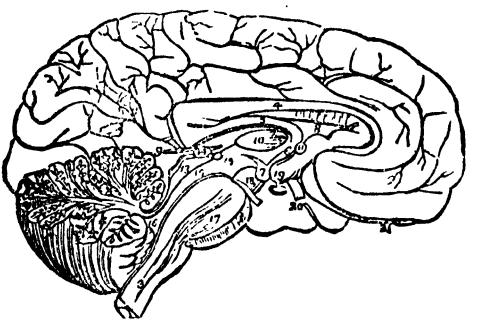

Fig. 13.—Longitudinal Section of the Brain.
Inner surface of left hemisphere and divided cerebellum, showing the arbor vitæ.

The spinal cord, and brain, and blood are formed under the influence of nerve matter belonging to the system of nerves of organic life, called the ganglionic or sympathetic system.

THE ALIMENTARY SYSTEM.

All organised beings require food. A rock is formed by a simple, more or less regular, aggregation of atoms,

and there it remains, without change, except as it is acted upon by external agencies. But a vegetable or an animal has an internal growth or development, and is subject to continual changes of form and matter. Every action is accompanied by waste. Each thought, each motion, necessitates a chemical change, by which matter is made unfit to remain longer in the system, or, at least, in the same relations. The waste or effete matter is constantly thrown off in various ways, and new matter must be brought in to fill its place. Vegetables gather this matter from the earth, by their roots, and from the atmosphere by their bark and leaves. Animals obtain their nutriment from vegetables, water, air. In animals, the stomach, intestines, lungs, skin, etc., correspond to the roots, leaves, and bark of trees.

Digestion of food begins in the mouth, where it is cut, crushed, and ground by a set of thirty-two teeth, which, in man, differ from those of carnivorous and herbivorous animals, and are adapted to the mastication of fruit, nuts, seeds, and roots. As food is mashed into a pulp by the teeth, it is moistened by the saliva, a digestive fluid, which is secreted from the blood by three sets of glands—the parotid, around the ear; the submaxillary, beneath the angle of the jaw; and the sublingual, under the tongue. When the food is sufficiently mashed and moistened, as it always should be, and mixed with the saliva, which is very necessary to its proper digestion, it is pressed back by the tongue into the pharynx, a membraneous and muscular pouch, which forms the upper part of the throat. The opening of the windpipe is closed by a valve, over which the food passes in safety, and the contraction of the pharynx, and the esophagus, as the narrower portion of the tube is called, force it down through the thorax into the stomach, which is an expansion of this tube, lying a little to the left, below the diaphragm.

When the food has been acted upon by the gastric

juice, which is secreted by the glands of the stomach, and has been rolled about and churned by the con-

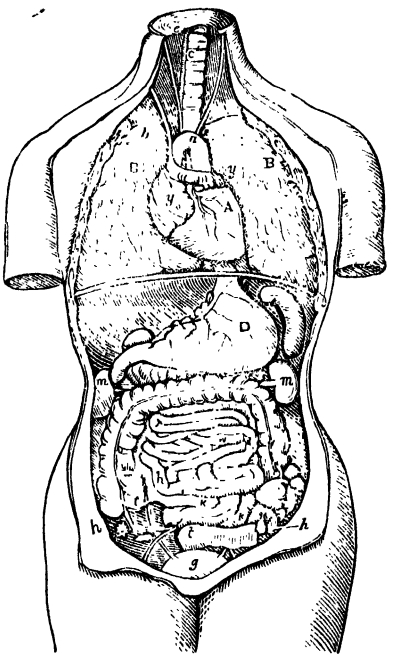

Fig 14.—Vital System.*

* A. Heart. B, B. Lungs. C. Liver. D. Stomach. E. Spleen. *m, m.* Kidneys. *g.* Bladder. *d* is the diaphragm which forms the partition between the thorax and abdomen. Under the latter is the cardiac orifice of the stomach, and at the right extremity, or pit of the stomach, is the pyloric orifice, below are the large and small intestines. *i.* Uterus. *h, h.* Ovaries. *g.* Bladder.

traction of its muscular coats, a portion of it, already prepared to enter the circulation, is absorbed by the veins, as is the water we drink, alcohol, and other liquids, while the remainder passes through the pyloric orifice into the smaller intestines.

Ten inches in length of the tube below the stomach is called the duodenum. Digestion still goes on, and in this tube, the food, converted into chyme in the stomach, receives the addition of two important elements—the pancreatic juice, from the pancreas, similar to saliva, and the bile from the liver. These change the chyme into chyle, which is now rapidly taken up by the lacteal absorbents.

We have now some twenty-five feet of small intestine, in all of which several interesting operations are performed. The veins are taking up such matter as can penetrate their coats; the villi, or little nipples, which contain the lacteal vessels, are selecting their matter by a kind of secreting process, which I shall soon describe; while millions of glands, with their follicles, or openings, are pouring out matter, either to aid in the digestive process, or to be cast out of the system. The entire length of the intestinal canal is a vast collection of organs, each performing its own vital function.

The small intestines open, by a valvular orifice, into the beginning of the large intestine, at the lower part of the right side of the abdomen. Here the contents become fœcal, having the appearance and odour of excrements, caused by the secretions of glands peculiar to this portion of the intestines. From the cœcum, with which the large intestine begins, we have the ascending colon, passing up on the right side, the transverse colon crossing over, a little above the navel, and the descending colon passing down on the left side, when it turns backward, and becomes the rectum, terminating at the anus, where a strong round muscle keeps a tight grasp of this extremity of the digestive

apparatus. Of the matter taken into the mouth, in a healthy state of the digestive organs, very little finds its way out at the anus. The bran of wheat, the skin and seeds of fruit, woody fibre, and other indigestible matter, is mixed with a much larger quantity of excrement, made up of waste matter of the system, poured into this canal by millions of glands, which separate it from the blood. This is evident from the fact that there may be copious evacuations from the bowels day after day, when no food has been taken.

The intestines are everywhere enveloped by a thin, shining, serous membrane, called the peritoneum, which also lines the sides of the abdomen, and covers its viscera; and they are gathered in their length to a kind of ruffle, called, in its different parts, the mesentery, mesocolon, and mesorectum. In the mesentery and mesocolon are found the arteries that supply the intestines, with the veins, nerves, lacteals, and lacteal glands.

THE LUNGS.

The entire cavity of the thorax, excepting the space occupied by the heart, large blood-vessels, and esophagus, is completely filled by the lungs. They are of nearly the same structure in birds and mammalia, as in man, a spongy mass, made up of air-tubes, air-cells, and blood-vessels, all bound together by cellular tissue.

The windpipe consists of the larynx, or organ of the voice, in the upper and most prominent part of the throat, which opens from the pharynx, just back of the root of the tongue; the trachea, a tube three or four inches long, made up of cylindrical rings and strong membrane, and its branches, or bronchiæ; which fork off to the right and left lung, and afterward divide like the branches of a tree, and are covered with masses of air-cells, into which they open, and which are clustered upon them like leaves on a tree, or more like grapes

on a stem; the cells on each twig opening into each other. There are many millions of these cells, and the internal surface of the air-tubes and cells in the lungs is estimated at 150 square feet, or ten times the

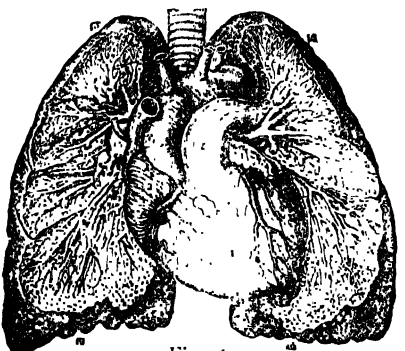

Fig 15.
Heart and Lungs, showing Blood and Air Vessels.

surface of the body. Around each of these minute cells is a network of arterial and venous capillaries, and it is through the coats of these that the air acts upon the blood, giving it oxygen, and receiving from it carbon. There enters, then, into the structure of the lungs, the pleura, or external membrane; the air-tubes and vesicles; the arteries, veins, lymphatics, nerves, and the areolar tissue, which holds them all together.

All the blood passes through the lungs, to be brought into contact with the atmosphere; the animal membranes forming no barrier to the chemical action of gases. This contact of the air with the circulating fluids is necessary to all organised beings—to vegetables and animals. In vegetables this contact takes place in the leaves, in fishes by the gills, in the higher animals by lungs.

THE LIVER.

The size of an organ is *some* measure of its importance. The liver is an irregular-shaped brown mass, weighing four pounds in health, but often much enlarged in disease. It lies on the right side of the abdomen, under the diaphragm, opposite the stomach, and partly covered by the short ribs. The liver is a collection of a vast number of glands, which separate the bile from the blood. The blood thus purified is the venous blood gathered from the stomach and intestines, which contains a portion of the newly absorbed nutritive matter. All these veins gather into one common vein, the vena porta, which enters and branches out in the liver into minute vessels; the purified blood collects in another set, and goes to the ascending vena cava. The gall bladder is attached to the liver, and serves for a reservoir for the bile, until it is needed in the process of digestion.

THE SPLEEN.

This is a large glandular organ, situated at the left of the stomach. It has no excretory duct, no known secretion, and its function is not understood. It is conjectured to be a large lymphatic gland. It is liable to inflammation, and to enlarging and hardening in malarious diseases.

THE KIDNEYS.

These are hard bodies, of a flattened oval shape, lying on each side of the spine near the last ribs. Each kidney is a collection of tubes and glands, ending in a central cavity,

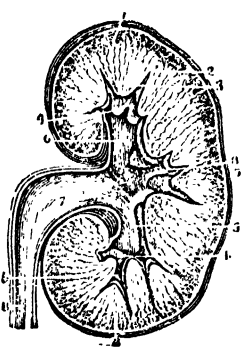

Fig. 16.—Vertical Section of the Left Kidney.

which opens into long tubes, called ureters. The office of the kidneys is to separate from the blood the urine, which is conveyed by the ureters to the bladder.

The separation of the urine, or rather the solid matter it contains, from the blood is so important that certain death attends its suspension for a short period.

BLADDER AND URETHRA.

The bladder is a membranous and muscular pouch, resting against the pubes in the middle, anterior portion of the pelvis. It terminates below in a tube, called the urethra, through which the urine is discharged. In men, the urethra is eight or nine inches long, when at its full extent. In women, it is not more than two inches. The urine is retained in the bladder by a sphincter muscle at its neck.

Fig. 17.– Bladder, Prostate Gland, and Seminal Vesicles.

MALE ORGANS OF GENERATION.

These consist of the testicles, or sperm-preparing organs, the seminal vesicles, the prostate gland, the penis, and their appendages.

The testicles are egg-shaped glands, each consisting of several hundreds of minute, convuluted tubes, ending in a single vessel, which conveys the semen, or vitalising fluid, secreted by these organs, into the seminal vesicles, where it is mingled with a secretion from the prostate gland, and is held in readiness to be ejected through the urethra during the sexual orgasm.

The testicles, in an early stage of fœtal development, are formed close by the kidneys, and gradually descend to the lower part of the abdomen, where they pass through the inguinal canal, and are lodged in the scrotum. They are sometimes retained in the body.

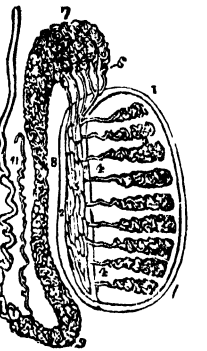

Fig. 18.—Anatomy of the Testes.

The prostate gland is a small body about the size and shape of a chesnut, just beneath, and partly surrounding, the neck of the bladder. See Fig. 17. Its secretion seems to be a vehicle for the semen.

The penis is small in infancy, and attains at puberty to a length of from five to seven inches, and is about five inches in circumference. Its shape is that of a cylinder, not perfectly regular, with a soft, delicate cushion, called the glans penis, at the end. This is the most sensitive portion of the organ, and in the sexual orgasm is the seat of exquisite pleasure. A soft skin loosely covers the organ, moveable, and forming a fold, so as partly, and in some cases wholly, to cover the glans penis.

The internal structure is very curious. In repose, it is small, soft, flabby, and easily compressible; but when in vigorous erection, it is distended, hard, and unbending. The change from one state to the other occurs in a moment—at a thought or a touch. The process by which this change is accomplished is not well understood, but it is probable that the arteries expand and are filled with blood, while a nervous action constringes the venous capillaries, so that it cannot return. But all the mechanism and operations of these organs is very wonderful, and much of it quite incomprehensible.

FEMALE ORGANS OF GENERATION.

These are mostly within the pelvis, and consist of the ovaries, or germ preparing organs; the fallopian tubes, leading from the ovaries to the uterus, or receptacle of the germ, where it remains during the whole term of gestation; the vagina, or passage to the mouth of the womb, which receives the penis during

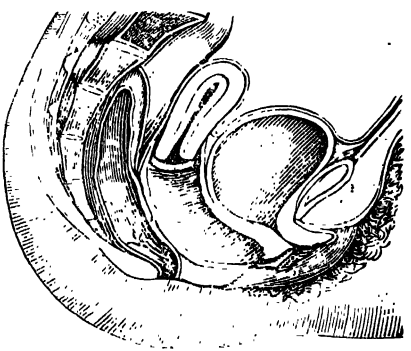

Fig. 19.—Section of Female Pelvis.

the sexual congress; and the lesser and greater lips and clitoris, a very sensitive organ, resembling the penis, and situated above the entrance of the vagina. The mons veneris is a cushion of fat covered with curling hair, and conveniently placed upon the pubes.

The most important of these organs are the ovaries —egg-formers—of which there are two, one on each side of the uterus, about the size and shape of the testes of the male, and performing a corresponding function. In them are formed the ova, or germs of new beings. When the germ has been perfected its sac bursts with considerable force, it is set free, seized

by the finger-like extremities of one of the fallopian tubes, through which it is carried into the uterus.

The uterus is situated centrally in the pelvis, behind the bladder, before the rectum, and four or five inches

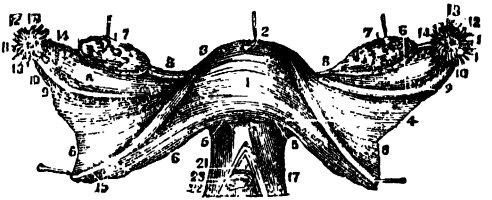

Fig. 20.—Uterus, Ovaries, Fallopian Tubes, etc.

from the mouth of the vagina. It is of a flattened egg or pear shape, with the small end, its neck, downward, and, except in pregnancy, about two and a half inches long. Its mouth can be felt at the upper extremity of the vagina.

In its healthy, unimpregnated state, the walls of the uterus are about half-an-inch in thickness, muscular and vascular, and the cavity is scarcely larger than a kidney-bean. After impregnation it expands so as to contain a fœtus weighing, in some cases, fourteen pounds, with membranes, afterbirth, and fluid weighing as much more. In cases of twins, where there are two fully formed fœtuses and two placentas, the bulk is greater. The uterus expands rapidly, and its minute and imperceptible arteries acquire great size; but in a few hours after birth, it contracts to nearly its previous dimensions. The vagina is a membranous canal, with muscular fibres, lined with a delicate mucous membrane, and forming the passage from the vulva, or external opening, to the uterus. It performs three offices: it allows of the periodical flow of the men-

strual fluid, and the passage of unfecundated germs; it admits the penis in sexual union, grasping it closely, and contributing to and partaking of the orgasm; and, finally, it admits of the passage of the fully-formed fœtus at birth. Thus a canal, which will sometimes scarcely admit the finger, expands to receive an organ five or six inches in circumference, and, under a peculiar action of the system, is dilated to allow of the passage of the head of an infant, which is five inches in its largest diameter. The vagina is furnished with numerous glands, and, when healthy, is abundantly lubricated with a fluid like saliva, both in the sexual congress and in the process of parturition.

The external organs consist of the inner or lesser lips, which are folds of the mucous membrane, called nymphæ, which seem to shelter and guard the entrance to the vagina, and the greater or external lips, which are thicker, and filled with fat, and which close over the inner. In most cases there is in virgins a thin fold of membrane, called the hymen, partially closing the mouth of the vagina. When this exists, it may be torn and bleed in the first union; but it is wanting in so many cases, and may be distended or ruptured in so many ways, that, though its presence is held to be sufficient proof of virginity, its absence is not a certain indication of the contrary.

The clitoris, placed above the opening of the urethra, is a miniature, imperfect penis, capable of erection, and, in the sexual congress, receiving, from the friction of the parts where it is situated, the most vivid excitement of pleasure. This excitement may also be produced artificially, as in the male organ, but with great loss of nervous power, and, if habitual, it destroys the sensibility of the part, while it wrecks the health of the whole system.

The bosom, containing the milk-forming glands of the female, is closely connected with the generative

organs in function and sympathy, partaking of their excitements. The nipple, indeed, in structure and erectile power, closely resembles the penis and clitoris. I shall describe it more particularly in connection with the glandular system and the function of lactation.

Fig. 21.—Mammary Glands.

The skin, or external covering of the body, is a vast network of areolar tissue, fibrous, elastic, and very strong—as we see it in leather, from the thickest sole-leather to the most deli-

Fig. 22.—Magnified Section of the Skin of the Sole of the Foot.*

* 3, Epidermis; 4, Rete Mucosum; 5, Cutis Vera; 6, Papillæ; 9, Fat-cells; 12, Sweat Glands; 13, Sweat Canals; 14, Pores.

cate glove-leather—through which is spread a network of arteries, veins, lymphatics, nerves, and glands; and it is protected on the surface by a horny scarf skin, or cuticle, which thickens into nails at the ends of the fingers and toes. Millions of pores allow the passage of perspiration, or waste matter of the body, through the skin. By its nerves we have the sense of feeling, of temperature, and the influences of air light, and electricity, and are affected with a variety of impressions. Over the whole body hairs grow from the skin, of matter similar to the cuticle, and performing some function of which little is known. Why the hair should be thick and long on certain parts and not on others, and why men have beards and women have not, are among the myriad mysteries of life.

The skin is continued into the alimentary canal, where it becomes a soft membrane, constantly lubricated by the mucous secreted from the blood by its glands, as perspiration, and an oily fluid softens the skin. Other membranes, very fine and shining, moistened with a more watery fluid, line the brain, lungs, and intestines. An excessive secretion, or lack of the power of re-absorbing this serous fluid, constitutes dropsy.

The joints are also provided with a membrane called the synovial membrane; and its secretion, serum, with an unusual amount of albumen, like the white of an egg, lubricates every joint.

The eye is also constantly moistened with the secretion of the lachrymal gland, placed at the upper outer corner of the eye for that purpose.

All through the body, moreover, the arteries pour out a perspiration to keep the whole areolar tissue moist, and this is as constantly taken up by the veins. When the equilibrium of this process is disturbed, we have dryness and hardening of the tissues in one case, or œdema, or general dropsy in the other.

The average stature of men at birth is 1·64 feet (one foot and 64 hundredths); at 2 years, 2·60; at 4, 3·04; at 6, 3·44; at 9, 4·00; at 15, 5·07; at 20, 5·49; at 40, 5·52; after which age it slightly diminishes, from the curving of the spine and solidification of cartilages. Women at birth are 1 foot 61 hundredths; at 2 years, 2·56; at 4, 3·00; at 6, 3·38; at 9, 3·92; at 15, 4·92; at 20, 5·16; at 40, 5·18.

The average weight is, of men at birth, 7·06 pounds; at 15, 96·40; at 20, 132·46; at 40, 140·42. That of women is, at birth, 6·42; at 15, 89·04; at 20, 115·30; at 40, 121·81.

Men and women at mature age weigh twenty times as much as at birth, and their stature is three and a quarter times greater.

A calcined human body weighs only 8 ounces; mere drying reduces it to one-tenth of its weight. Thus nine-tenths of the whole body are water.

CHAPTER IV.

PRINCIPLES OF PHYSIOLOGY.

THE primitive form of organic life is a cell, or vesicle. As seen under the microscope, there is a cell within the cell, or a nucleus, and within that a point called nucleolus—cell within cell. It is in this manner that matter, under the influence of what we may call vital force, takes an organic form. It has parts, an exterior pellicle or skin, and an interior, filled with fluid.

The cell is the beginning of every organised being—from the simplest vegetable to the highest animal—in each case we have but a microscopic point. It may be developed into a toad-stool or an oak, a worm or a

philosopher; but at its beginning and in a certain stage of its progress it would be very difficult to tell one from the other. They have the same appearance under the microscope, and are composed of the same elements. But in the microscopic germ—in this simple watery cell—is the vital intelligent force that determines and accomplishes its development.

A cell may divide itself into two, and these into four, and so on; and by this kind of multiplication, there may be a rapid growth; or a cell, containing within itself several smaller cells, may burst, and each of these may, in turn, develop, generate, and dissolve. In one way or other the organic being increases and multiplies.

Under the moulding power of a force, guided by intelligence, which presides over the growth of each plant and animal—the soul and guiding power of the organism—these cells take on all organic forms. Flattening, the cells become membrane; elongating, they are fibres; joining together, by an absorption of their joining parts, they form tubes; and so of all the organised tissues. In this way we have woody fibre, sap tubes, and all the parts of the vegetable, from its first leaf to its flower and perfect fruit. In the same way, we have cells forming blood-vessels, muscle, nerves, and all the most complicated and beautiful organs of the human body.

But before a cell can be formed there must be matter suitable to its formation. We have here the principles necessary to form a universe. There must be matter and the intelligent forming spirit. This matter out of which cells are formed is called protoplasm or blastema. It is essentially albuminous, and the egg of the common fowl, out of which is formed all the parts of the chicken, is the type of all blastema.

It is believed by some that the blastema may take on the forms of simple fibrous tissue and basement membrane, without passing through the cellular trans-

formation. These parts are less vital than others, and less subject to decay, while the whole cellular substance of the system—all parts generated by cell growth—is in a constant process of change, of dissolution and reproduction. Each of the myriad cells that goes to make up the human body, seems to have its own birth, life, and death; it dissolves, is carried away, and another cell takes its place. All vital processes, even those of thought, are accompanied by the destruction and reproduction of cells; and hence the necessity for constant nutrition and constant excretion —the perpetual supply of new materials, and the conveying away of the waste matter.

Thus it is in the human body, as in the human race. The individual cell dies and another takes its place, but the body lives on. The individual man dies, the life of the race continues. In the human body we have an elaboration of alimentary matter into blood, and from this blood is formed the cells of all the vital tissues. All analogy points to the birth, growth, maturity, decline, and death of the human race; the same as in the individual man. And it may be that planets and systems are subject to the same law. We appear to be in the early period of our planet and our race. We look forward to the maturity and happiness of both man and earth—man, of which each individual forms a part—the earth, our home.

Let us love and beautify this home; let us try to educate and benefit this humanity. No organ of the body, no cell which adds its almost infinitesimal life to the structure of an organ, can be isolated from the other organs and cells. Complete in its individuality, it is yet held in the bonds of closest sympathy. One life pervades all—one spirit governs all. If one is happy, all rejoice; if one is diseased, all suffer. So it is with the individual man and the race. Each man has his own individual life—his rights, his happiness—

but a bond of social sympathy and a great soul of humanity pervades the race. All humanity suffers for the disease or wickedness of any individual; all humanity is ennobled by every great deed. These are mysteries; but life and death and immortality are mysteries. The universe is a mystery; the fact of our existence, and of the existence of our system, and planet and race, are profound mysteries.

But they are mysteries that we shall solve. God has not mocked His human children with wants never to be satisfied, curiosity never to be gratified, and aspirations never to be made realities. Nature is our book, and we hold in our own organisation and consciousness the key of all mysteries.

In a certain sense, God may be said to be the soul of the universe—its guiding, informing spirit; and every organised being, whether vegetable, animal, or man, is pervaded by a spiritual principle, which acts upon matter, moulds it to its own form, and controls the whole phenomena of organic life, consciousness, passion, and intelligence. We see everywhere in nature the proofs of intelligent design, not merely working outwardly, but inwardly, as the Apostle says, "God working in us, both to will and to do."

It may not be readily admitted that the operations of organic life are controlled by a pervading intelligence; but I see no way of escaping this conclusion. When the tendril of a climbing plant reaches out to its supporter; when the roots of a rose-tree travel directly toward water, surmounting all obstacles, and changing their course as the position of the water is changed; when I see plants, growing in partial darkness, reaching toward a ray of light, upward, sideways, and even downward, as the ray is changed; when I see the flowers of two plants of opposite sexes inclining to each other, and coming together to consummate their nuptials, or the male organ of a flower, which is the

love-shrine of both sexes, bending downward or reaching upward to embrace its feminine partner; when I see the pistil, or female organ of a flower, surrounded by several loving stamens, bend first to one and then the other, to receive the vivifying influence from each, I see signs of intelligence. "But that intelligence," you say, "is external to the plant or flower; it does not reside in it." How do you prove that? Why not say, as well, that the intelligence of the ant, or bee, or canary bird, or dog, or elephant, are external, and do not belong to them?

And in the operations of the animal organisation, the merely vegetative functions, I see evidence of the same intelligent action. When we tie the large artery that supplies the leg with blood, the limb is first cold and numb; it calls for its accustomed supply of nutriment, but the channel is closed. What is done? Pretty soon a warmth is diffused through the limb. The small arteries below, that interlace with those above the ligature, enlarge themselves so as to supply the limb with blood. Here seems to be the consciousness of a want, and that want supplied by the most intelligent operations. Where does that intelligence reside? If you cut a hydra into twenty pieces, where is the intelligence that forms for each part all the other parts that belong to it, so as to make twenty perfect animals?

So, if a bone is broken, the nerves and vessels about the fracture set to work as intelligently as so many bees to mend their comb. They demand and receive a large supply of blood; they separate from it the materials of bone; first the gelatine, and then the earthy matter. They form a plug of bone in the hollow of the shaft, and then a ring of bone around it. Having made it temporarily secure, they then set to work, deposit and build up the bone where it should be, and finally remove the temporary plug and ring of

bone, leaving the part with scarcely any mark of fracture. Where is the intelligence that presides over this complicated and beautiful operation? In the brain? There is not the least evidence of it. The whole process would go on just as well without a brain—for the whole body of an infant has been perfectly formed without brain.

These intelligent operations take place continually, in every part of the body, from the beginning of its development to the end of life. A thousand facts prove that each organ, each cell, and each atom has its own life, in harmony with, and contributing to the general life, or the spirit which pervades the whole. And when this material organisation shall have performed its uses, and is laid aside at death, the spirit continues to exist, parted from the earthly envelopment, but retaining force and form.

It would seem that matter is a temporary accident; spirit a more permanent and higher reality. This state of existence seems to be a necessary condition of our spiritual progress. Our earthly life is a real necessity, and a real blessing, and we should endeavour to improve and enjoy it in all its integrity and force. We should give ourselves all the advantages of a full, healthy, integral life; a life of energy, activity, beauty, and enjoyment. The standard of a true life is its amount of happiness; and happiness comes from the fullest and highest exercise of all the passions of the human soul—from a life full of the highest harmonies. We are not to despise this life, its uses, and its enjoyments. God has given it to us for a noble purpose, and it is our duty to enjoy what He has given us. Our bodies, then, are worth understanding, and worth taking care of.

In considering the bodily life of man, we may class his organs and functions into three groups, which may be distinguished as the Vegetative or Organic, the

Sensitive or Animal, and the Generative. By the vegetative or organic system, I mean the functions and organs connected with nutrition—the building up, growth, and nourishment of all parts of the body. This system has its own nervous organisation, the sympathetic or ganglionic, with nervous centres governing digestion, the formation of blood, its circulation, absorption, secretion, &c.

The animal system consists of the organs and faculties of sensation, locomotion, thought, feeling, passion, and spirituality.

The generative function is connected with both systems of organs, and requires for its perfection the exercise of all the powers of both, in their highest development and vigour.

These three great functions are named here in the order of their development and action. The body is built up cell by cell, and organ by organ, from its primitive form, by the nerves of organic life acting upon the nutritive processes. The brain and senses are inactive in the fœtus; but the heart pulsates, the capillaries are at work, and the body is prepared for independent life. Under the intelligent agency of the nerves of organic life, all the structures of the body are perfected. We have that beautiful optical instrument, the eye, which our best artists can only bunglingly imitate, formed in the darkness of the womb. We have the complicated apparatus of hearing, still less understood, silently elaborated; and the still more astounding organ of thought. They are all formed ready for action; but they are all at rest, until, at the end of the nine months of gestation, independent life begins, and the animal powers are added to the organic. The child breathes, then it exercises the propensity of alimentiveness; and, day by day, it gradually acquires the power and use of its intellectual and moral faculties.

This striking difference is to be noticed between the organic and animal organs. The first require no education. They act perfectly from the beginning. The heart beats as well when it is a pulsating point beneath the microscope, as at any subsequent period. The capillaries and glands need no training to perform their offices. But the animal organs require exercise and education. It is true that those most intimately connected with organic life, act with an instinctive spontaneity; such as sucking, swallowing, etc.; but locomotion, language, and the exercise of the mechanical and intellectual powers, comes to the human being by slow degrees, and the higher faculties come one after another into their development and action.

Another difference is in relation to consciousness. If a man were not told, he would never know that he had heart, stomach, liver, kidneys, and any of the internal organs of nutrition. Even with all the aids of scientific observation, what ages elapsed before the circulation of the blood was discovered? From the time food is swallowed, until it enters into the structure of our organs, lives its brief organic life, dies, and is conveyed out of the system, we have no particular consciousness of any of the changes through which it passes. In health there is a general feeling of satisfaction and pleasure in the performance of every function; but this feeling is vague. In disease, these acts may be accompanied by pain.

But it is the law of the organic system, that its functions are unconscious and vaguely pleasurable in health—and that these nerves only acquire sensation in disease, when they produce pain by their connection with the nerves of sensation belonging to the nervous system of animal life.

A good digestion, a brisk circulation, a vigorous action of the capillaries and corresponding secretions, give a general feeling of health, and a degree of

pleasure of which we are hardly conscious, until, by being deprived of it, we have data for comparison. To have made us conscious of these incessant actions of our vegetative life, might have been a discomfort. While they all go on rightly, it is enough for us to have the general and pleasant feeling that all is right; but when there is food in the stomach that cannot be digested, poisons in the system that cannot be eliminated, nature cries out against the outrage, and her warning cry is *Pain*.

The grand centre of the superadded functions of animal life is the brain. Here is the centre of consciousness, of sensation, of voluntary motion, of thought, of passion. The brain, and its appendages, the spinal cord, and the nerves of sensation and motion, are built up and constantly nourished by the vegetative functions. The perfection of human organisation is the proper proportion between the development and activity of these two classes of functions, and of the third to these.

The brain is an organ of slow growth, and requiring practice for the due exercise of its organs. This is true of thought, as well as of voluntary motion. We learn to reason as we learn to walk; we require practice in thinking as we do in dancing.

There is no power of the soul that may not be developed and strengthened by exercise, or crushed by repression, or weakened by inaction. But you cannot train the beatings of the heart, nor educate the peristaltic motions of the bowels. All you can do for the vegetative organs is to give them good conditions. For the animal powers you may do much more. The former may be perverted, weakened, and destroyed, so also may the latter, but they may also be educated to an unknown degree of power and perfection. In health, the stomach, heart, and other organs of the vegetative system will act alike in the most ignorant savage and the greatest genius.

Everywhere the organic nerves mingle with those of animal life. The vigour of brain and muscle depend upon the perfection of nutrition, and the processes of nutrition are greatly influenced by our thoughts, feelings, and movements.

The third function, or system of functions, is still later in development and action. Neither the cerebellum, believed by phrenologists to be the seat of amativeness in the brain, nor the sexual organs, attain their full size and power of healthy action until the age of ten to eighteen years, varying with climate and constitution. But even at the age of puberty, the system is still too immature for the highest and most perfect exercise of the procreative power. Men and women should come to maturity before they can give the best mental and bodily constitutions to their posterity.

CHAPTER V.

OF THE ORGANIC SYSTEM.

In the organic or vegetative system, we have to consider:—

1. The acting force, or element of vitality residing in the ganglionic nervous system. Of the nature of this life force we know nothing; and we can only observe its laws or mode of action.

2. The matter acted upon; and this is the blood, or nutritive fluid, from its formation by the assimilation and vitalisation of aliment, to the last and highest products of secretion and elimination.

3. The apparatus of various kinds by which these processes are performed, as the organs of digestion,

absorption, assimilation, circulation, respiration, nutrition, secretion, excretion.

The central thing here is the blood, and we have to consider the relation of the blood to the food from which it is formed; to the atmosphere by which it is purified and vitalised; and to the organs and functions of animal life.

This order, rendered as simple as possible, may still seem complicated, but in a system in which all the parts are so interwoven, and mutually dependent, no plan can wholly free us from complexity.

For example, if, in explaining the process by which blood is formed from food, I begin with the chewing of this food, and its being mixed with saliva, I stumble at the very outset upon a process of secretion. The blood makes saliva, and the saliva helps to make blood. The blood makes gastric juice, and the gastric juice helps to convert food into blood. This is the fact, also, even with regard to the active force which presides over these processes. The vital force, or ganglionic nervous power, assimilates nutritive matter, and vitalises it into the living fluid blood—but it is the blood that nourishes these nerves, and gives them vital force. The blood makes the nerves, and the nerves make the blood. So the blood builds up and nourishes the heart, arteries, and veins that carry it over the system. And we shall find that to a greater or less degree this reciprocity of influences extends to all the processes of life.

Considering the acting force, or nervous power, as only to be understood by its effects, let us now consider this reservoir of life, the blood, in its various functions and relations. It is a thin red liquid of a bright scarlet colour, when drawn from an artery; but of a deep crimson, or purple, when it comes from a vein, and venous and arterial blood differ as much in their properties and constituents. The quantity of blood

in a healthy middle-sized man is estimated at 25 or 28 pounds, or about one-fifth the weight of the body.

When allowed to stand for some hours after being drawn, the blood separates itself into two portions, a central, solid portion, called the clot, and a yellow watery serum. The clot is composed of a mass of fibrin, which has drawn together, in its meshes, a quantity of blood discs, or flattened cells, about one five-thousandth of an inch in diameter, which contain the red colouring matter.

Blood consists of water, fibrin, albumen, and some mineral constituents. Its most important ultimate elements are carbon, hydrogen, oxygen, and nitrogen, and it contains the materials necessary for the nutrition of every tissue of the body, and the matter of all secretions. The milk, bile, urine, fœcal matter, perspiration, saliva, tears, are all in the blood, actually existing, or with their elements ready to be combined.

This blood is constantly circulating through the system. It passes through the heart at the rate of about five hundred pounds an hour. All this passes through the heart, and passes through the lungs, where, through a million tubes, it rushes in a full stream, like an ever-rushing river, coming in contact with the air we breathe. Then it all pours through the great aorta, branching out, like a vast tree, and it goes on until every atom of the body is supplied with the fresh, bright, arterial fluid.

Without it is no motion, no sensation, no life. Check for an instant the current of blood to the brain, and you have syncope; prevent its becoming arterialised by contact with oxygen, and you have the insensibility of asphyxia. It is not blood only, then, that is necessary to sensation and life, but oxygenated, arterial blood—blood of a certain chemical organisation.

This blood is alive. It is as much alive as any

muscle or nerve in the body. A dead liquid would not answer, in contact with living tissues. And this conversion of dead matter into living blood is one of the mysteries. It is life that begets life, and it is the vitality constantly generated in the nervous centres of the organic system, that gives life to the blood.

When blood is drawn, it does not die at once. Its clotting is a vital operation. If the blood is killed at once by a stroke of lightning, it never clots, but soon turns putrid. Some blood clots and turns putrid more slowly than other. Strong, healthy blood is longer in going through these processes than weak, sickly blood. The human blood that is made from pure vegetable food, will keep whole days longer than blood made by living on the flesh of other animals.

The assimilation of nutritious matter, the formation of the primitive blood globules, and their vitalisation, appear to take place in the lacteal and lymphatic glands, under the influence of the nerves of organic life. In this system we have matter brought from all parts of the body, passing through great numbers of these glands; we have also the matter absorbed from the intestines, by the process of cellular formation and dissolution; matter from each death rising to a higher life; and all this matter goes to mingle with the general current of the blood. In it may be seen, by the microscope, the lymph globules, white, clear, but destined to imbibe colouring matter, and become red globules.

But before we go farther, let us glance a moment at the structure and action of glands. All vital actions seem to be carried on by means of surfaces. The more important the operation, the greater the surface concerned. A simple membrane gives a certain extent of surface; we have still more in cells, and still more when these cells line tubes, and those tubes increase their length by multiplied convolutions.

In the human body we have all sorts of glandular apparatus, from a single follicle, or depression, up to the immense convolutions of the seminal tubes in the testicle, or the still more complicated nervous tubuli in the nervous centres.

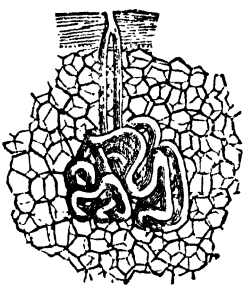

Fig. 24.—A Sweat Gland from the Palm of the Hand, magnified 40 diameters.

Wherever any vital action is to be performed, we have, by some means, an extent of surface proportional to its importance. In the lungs, the air-cell surface is estimated at 1500 square feet. In the same organ the convolutions of capillary vessels, in which the blood is brought to imbibe oxygen from the air and give off carbonic acid, must make a surface many times greater. The vessels and secreting cells of the liver contain a vast amount of surface. The kidneys are a compact mass of tubes. Through a vast net-work of mesenteric glands, the chyle passes, on its way to be converted into blood.

The lacteal and lymphatic glands, which are of a similar character, and which probably perform a similar office, are liable to be diseased, by poisonous matter passing through them. Thus in the absorption of syphilitic matter, large swellings, called buboes, are formed in the groin, where there is a mass of these glands. Similar buboes, but not of so malignant a character, sometimes arise from gonorrhœa. The glands of the neck are swollen in scrofula, and sometimes those in the armpits. But when the glands of the mesentery are diseased to any considerable extent, the result is a slow, wasting consumption. The system

demands blood, the blood demands its aliment, the stomach feels the demand in a craving appetite, but the channels of communication are cut off. The glands cannot perform their function. The system wastes; its matter is used over and over to make new blood, as long as it will answer for this purpose; but this cannot go on. The patient sinks into a hopeless marasmus, and literally starves to death. This disease is called consumption of the bowels, to distinguish it from the consumption of the lungs.

There are going on in every part of the system the most constant and rapid processes of secretion, or the separation of various matters from the blood, and the additions to the blood must correspond with these, to keep up the equilibrium of life. After arriving at his full growth, a man may live on for many years, scarcely ever varying in weight. He consumes tons of food, and gives off tons of excretions. There may be a gradual deposition of fatty matter in the cells of the areolar tissue, a stock of food laid up for the wants of age, when the partial failure of digestion may render such a supply convenient; but this variation is but slight in ordinary cases. Day by day, consumption and waste very nearly balance each other.

The reader may have already perceived that there are two modes by which matters get into the blood, and they get out of it in a similar manner. One mode is by simple mechanical absorption or transudation; the other is a more vital process, and is performed by means of glands, or cells, under the influence of organic nerves. For example, if a pint of water is taken into the stomach, when demanded by thirst, it is sucked up by the veins as by a sponge. In a feverish state of the system, if a pint of water is injected into the rectum, it is also quickly absorbed into the circulation. The veins of the skin also absorb water in bathing, and even from the atmosphere.

Water is not digested, but is itself the great digestive agent. It undergoes no change, unless by analysis and synthesis, but is simply absorbed. This is also the fact respecting many substances dissolved in water, or themselves liquid; and this is the reason why water for drinking should be soft and pure. Alcohol passes from the stomach directly into the circulation as alcohol, by venous absorption. It passes through the liver, exciting and disordering that organ. It is carried by the blood to the brain, producing exhilaration, intoxication, and finally stupefaction. It passes off by the lungs, tainting the breath, by the skin, by the kidneys, and doing mischief everywhere. Pure alcohol can be distilled from the blood, brain, breath, or urine of the drunkard. If the finger be dipped in spirits of turpentine, in a few minutes it can be smelled in the urine. Many things get into the blood through the lungs. If we breathe the vapour of chloroform or ether for a few moments, it taints the breath for many hours, having been absorbed into the blood and gradually expelled again. Thus we may be poisoned in our food, our drink, in the air we breathe, and by the substances we come in contact with. And in each case it is the blood that suffers, and through the blood the nerves of both animal and organic life. And as the blood has its own life, the blood may be fatally poisoned, and this is unquestionably the fact in certain epidemic and contagious diseases.

But the most important and vital portions of the blood are received by means of another and a more elaborate kind of absorption, or assimilation. The small intestines are covered with villi, or minute excrescences, millions in number, and presenting a vast surface, having no openings, but containing an apparatus of blood-vessels and nerves, where, by a process of cell formations and dissolutions, the matter of nutrition is received into the circulation.

Before food can become chyle, and from chyle be vitalised into blood, it must be comminuted and dissolved—dissolved so thoroughly as to pass through

Fig. 25.—Villi and Follicles of Ileum, highly magnified.

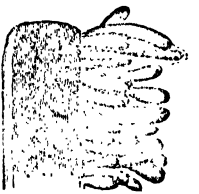

Fig. 26.—Longitudinal Section of Small Intestines, showing Villi.

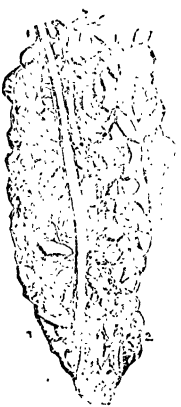

Fig. 27.—Arteries and Veins of an Intestinal Villus, magnified 45 diameters: arteries dark.

Fig. 28.—Injected Veins from Coat of Intestine.

animal membrane, like water or oxygen. And it does become so by the process of digestion. It is mashed, or should be, by the teeth; it is moistened and partly

dissolved by the saliva, which flows into the mouth just when it is wanted, from three pairs of glands. It is lubricated by mucous glands around the roots of the tongue, in the pharynx and esophagus.

Arrived in the stomach, with digestion well begun, the blood gathers around this organ, and distends its coats. From this blood the gastric glands secrete the gastric juice, with its basis of hydrochloric acid, and its wonderful dissolving power. It is poured from the orifices of minute follicles, opening in the folds of the mucous membrane. Of these follicles there are two hundred and twenty-five in the square of the eighth of an inch; fourteen thousand four hundred in a square inch, or one million two hundred and ninety-six thousand follicles to the entire stomach, and each of these follicles the outlet of a complex glandular apparatus, surrounded by a dense net-work of blood-vessels and nervous fibres.

These follicles, pouring out the secretions necessary to the digestive process, or giving exit to matter which is to be excreted from the bowels, extend through the whole length of the alimentary canal. In the five feet length of the colon, these follicles are very close and minute, and their number is estimated at nine millions six hundred and twenty thousand.

But even this vast amount of surface—and all the length, convolutions, and folds of the intestines are to give surface: all these glands, follicles, and villi, are surface—is not enough. To pour a kind of salivary fluid into the duodenum, or small intestine near the stomach, we have a glandular mass called the pancreas, weighing several ounces; while the liver is a mass of glands separating bile from the blood, weighing four or five pounds.

We get a much clearer idea of the organs of the body, when we consider each individual portion—each villosity, or each follicle, as a distinct organ,

performing its appropriate function. But however minute these may be, we must go further, and consider each cell as the final individual, in which resides the functional power. And each cell is formed by the nervous power, and performs its function under nervous influence. Withdraw the nervous power from the salivary glands, and the parched mouth receives no saliva. Under a sudden paralysis of the nervous system, from some shock, the tongue cleaves to the roof of the mouth, the food sticks in the unlubricated throat; no gastric juice is poured into the stomach, and the food, lying a dead weight, oppresses the organ, or irritating like any foreign substance, produces nausea and vomiting; the action of the bowels ceases, and we are affected by constipation, or in their relaxation, have diarrhœa. All this disorder comes from a disturbance of the nervous equilibrium.

When the food has been transformed into blood, its vitalisation is not completed until it has been brought in contact with the atmosphere. The blood is a living fluid, and, like all living beings, *it must breathe*. And it demands pure air. No sooner has it passed into the right side of the heart, than it is thrown into the lungs, where every drop gathers around a vesicle of air. It asks for air, with an importunity that will not be denied. We cannot withhold the supply. The blood must breathe. It must have oxygen. Each blood disk rushes to the net-work of fibres, which we call membrane, sends off its atom of carbonic acid, and receives its atom of oxygen, blushing like a bride. In the capillaries it finds tissues which want oxygen.

The action of the blood in the capillaries is obscure. It turns from arterial to venous, changing its colour from scarlet to purple; loses oxygen, and receives carbonic acid. New matter is deposited in the tissues by cellular appropriation, and the waste matter is removed, and in this process there is an evolution of

animal heat. All this takes place under the influence of the nerves of organic life. And, in every minutest part, this nervous power seems to exercise an adaptive intelligence, which provides, to a great extent, and as far as possible, for all exigencies.

And now the blood, having eaten its food, and breathed its air, and performed its work in the capillaries, where it builds up with new, and whence it conveys whatever rubbish of the old matter, must be relieved of its burden, and kept sweet, pure, and vigorous, that it may give sweetness, purity, and vigour to all parts of the system, and especially to the brain and special organs of the soul, to which it first and chiefly ministers.

For this purpose, we have a set of cleansing organs. Some of these have been already noticed. The fæcal matter is poured from the blood-vessels in the mucous membrane of the intestines, through millions of openings; and this action of the bowels is one of the conditions of health. The liver separates from the blood a great mass of carbonaceous matter, which, while assisting in digestion, is not the less excrementitious, and if the action of the liver ceases but for a day, the skin is tinged with the yellow hue of the retained bilious matter.

Two large branches of the abdominal aorta convey powerful currents of arterial blood to the kidneys, which, by a complicated and beautiful apparatus, separate from it the urine, full of the waste nitrogenised matter of the tissues. Here is muscular matter with its sulphur, and nerve matter with its phosphorus. Here is the ammonia, formed by the combination of nitrogen and hydrogen. Here are salts and minerals, the latter, when in excess, sometimes forming gravelly and stony accretions. The kidneys are vital organs; for, if the matters they separate from the blood, and send off to the bladder, through the ureters, were

retained, they would poison the blood to putrefaction, and paralyse the brain to coma.

The skin is not less important as a great depurating organ. I call the skin an organ, as I do lungs, liver, kidney. Like them, it is a vast collection of individual organs; each at work by itself in this great process of purification. Like the lungs and alimentary canal, the skin has internal functions, as well as external. The blood breathes by the skin, receives oxygen; and it is through this avenue that it gets the life giving influence of light, and aromal influences, electrical, magnetic or mesmeric, and miasmatic. The skin, even with its covering of horny cuticle, offers but little impediment to such liquids as water, alcohol, spirits of turpentine, etc., and the gases travel through it without hindrance.

Fig. 29.—A Portion of Kidney magnified 60 diameters.

Franklin's air-bath was a very common-sense discovery of a *very* common-sense philosopher. We may be invigorated or poisoned through the skin. It is a truly vital organ. Let a certain portion of its surface be destroyed by any means, and death is inevitable. The Frenchman who covered a little boy with gold-leaf, to make him look like a California cupid, killed him as surely as if he had put a ligature around his windpipe. The water-cure physicians have by no means over-rated the importance of the skin.

Like the mucous membrane of the intestines, the skin is everywhere pierced with follicles, here called pores, each of which is the outlet of a gland, formed by the convolutions of the tube, and around which is a mesh of blood-vessels and nerves. These glands perpetually separate from the blood, and these excre-

tory ducts pour out, the matter of perspiration. This passes off in vapour, unless it is in such a quantity that the atmosphere cannot take it up fast enough, when it gathers in liquid drops of sweat.

The matter of this secretion varies with the state of the constitution, and the condition of this and other organs, which are engaged in the same general work of purification. When the circulation is active, and the skin healthy, every sudoriferous gland pours out the matter of perspiration. In violent exercise the whole skin is covered with it, and the garments saturated. Wherever there is an active determination to the surface we have this result. But, in this case, as in so many others, one act has several uses. The elimination of perspiration is a cooling process, as well as a purifying. When we increase the warmth of the body by any means, nature calls for the cooling process, and this call of nature is answered by a rush of blood to the glands of the skin, and the pouring out of this vapour, and the system is cooled by this process—so that men can bear the hottest climates, the Turkish bath, furnaces, and even ovens hot enough to bake food. In the blanket pack we determine to the skin by the accumulation of vital heat.

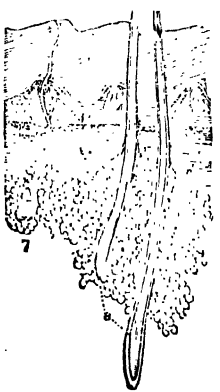

Fig. 30.
Vertical Section of the Skin magnified.

When the pores of the skin are closed by the constriction of cold, or the action of its glands is diminished by a weakened or diseased constitution, the work of the skin is thrown upon other organs.

The kidneys pour out more urine, the liver secretes more bile, the lungs are filled with exudations; sometimes the action of the bowels is heightened to a diarrhœa. Colds and catarrhs are the ordinary result of checking the perspiration, or "taking cold."

On the other hand, the skin is often compelled to perform the function of some internal organ. In torpid states of the liver, the skin is filled with bile. In disease of the kidneys, the perspiration has sometimes the distinct odour of urine; in obstinate constipation of the bowels, it has the smell of fæcal matter. In the same way, each of the secreting organs may act vicariously for some other.

Thus much here of the relations of the blood to its means of purification. We shall need all this when we pass from physiology to its application in hygiene, pathology, and therapeutics.

The evolution of animal heat seems, at the first glance, to be as simply a matter of chemistry as the warming of a house by the combustion of coal in a furnace. But is it really so? True, our food contains carbon and hydrogen. We take in at every breath a portion of oxygen. The oxygen combines with the carbon to produce carbonic acid, and with the hydrogen to produce water. This is a real combustion, going on all over the body, and heat is the necessary product of combustion. The chemists have weighed all these elements, and their products, and there can be no mistake about the facts; but there is still an element to be taken into the account—the element of nervous power or vitality. That controls the circulation of the blood, congesting it in the viscera of the chest and abdomen, or throwing it to the surface. That fills the capillaries, or empties them. That causes a limb to become pale and cold, or gives it the swelling, redness, and heat of a violent inflammation.

And though the organic bases the animal, the animal presides over the organic. The passions and emotions of the mind influence the most purely organic functions. The ardour of hope, or desire, may give warmth to the whole system, while disappointment or fear may chill the frame, and set the teeth to chattering. The emotion of jealousy may make the hands, in a few moments, turn deathly cold; or a happy love may make them glow with the fires of passion. A thought sends the hot blood to the face in blushes. Disappointed love gives the sensation of a hard, dull, aching oppression round the heart. The lungs are constricted, and relieve themselves by frequent sighs. The heart may even break from the excess of this passion, in its painful and discordant action. Many such facts will suggest themselves to the observing reader.

The manner in which demand governs supply in the organic system, is a proof that this law of supply and demand is fundamental, and therefore universal. In the water-cure, we practice constantly upon this principle. If we want blood and action in a part grown weak and diseased, we apply cold. The increased and urgent demand brings the supply; and, as power increases by exercise, there soon comes the habit of action, and a cure. Heat, in the whole system, as in its parts, is generated as it is required. Supply is in proportion to demand. Send a man to discover the North Pole, and he comes to not only endure, but to be quite comfortable, with the thermometer at 30 or 40 degrees below zero. Send him to the tropics, and he keeps cool by a copious perspiration at 100 degrees above. He can even sit in an oven heated to 300 degrees, while a potato is baking beside him. This power of adaptiveness belongs to the nervous system.

There is a set of organs belonging to the organic

system, termed the ciliary bodies, from their resemblance to the eyelashes. Of microscopic minuteness, they grow upon the epithelial cells, which pave the mucous membrane. They are found in the air-passages of the lungs and nostrils, in the fallopian tubes, vagina, and urethra, and the ducts of the glands, and in all animals down to the lowest species.

Standing upon these minute cells, these ciliary bodies, by millions, move continually, and with a rapidity that makes them invisible, until they become gradually slower with the death of the part. They have no perceptible connection with muscle, blood-vessel, or nerve. In animalcules, they are the source of rapid motions. In zoophytes, they surround the mouth, and force currents of water through the passages, for purposes of nutrition or respiration. Constant and powerful liquid currents may be seen whenever these animals are examined under the microscope. In the higher animals, they line the internal passages, and the effect of their action is to carry the fluids in their proper direction. They free the bronchial tubes, keep up the motion of the secretions, and propel the ova through the fallopian tubes to the uterus. What is very wonderful is, that if a very small piece of mucous membrane is cut off, removed entirely from the body, and placed under the microscope, this action will go on for hours. This, however, is no more remarkable, perhaps, than the powerful independent action of the heart in some of the lower animals. If the heart of a frog is removed from its body, and laid upon a table, it will continue to beat for some time; and it is said that the heart of a sturgeon (a large fish), hung up in the sun, has continued to beat until it creaked with dryness.

CHAPTER VI.

THE ANIMAL SYSTEM.

THE functions of animal life are—

1. Sensation, through the means of sight, hearing, smell, taste, and touch, or feeling; with a deeper sense transcending these, but seldom or partially developed, and vaguely known as impressibility; organs, the nerves of sensation.

2. Perception, intelligence, memory, passion, will; all those varied powers of mind or soul whose special organ is the brain.

3. Voluntary motion, including all language, natural and acquired, and all modes of expression; nerves of motion and the muscular system, with its relations.

The organism of this series is symmetrical, or made up of two halves. This is true of the bones, muscles, etc., of the motive system, of the senses, and of the brain and its nerves. In this respect, these organs differ notably from the heart, stomach, liver, the whole digestive apparatus, and the nervous system of organic life.

The brain is the organ of the mind; and in this expression we recognise the existence of a soul or spirit which thinks, feels, wills, and acts, of which the brain is the material instrument through which it acts upon nerves and muscles.

The best analysis and classification of the faculties and passions of man we have, has been made by the phrenologists, though still imperfect; for we are conscious of possessing faculties for which they have not discovered organs. And the division of the cerebral organs into those of propensities, sentiments, and intellectual faculties, is not quite satisfactory; for every

power of the intellect, even Form, Order, or Number, may become a passion; while the sentiments and propensities seem to have the properties of intelligence. Conscientiousness and Benevolence do not seem mere blind impulses, and thought and memory are joined to feeling. The "intuitions of the heart" seem to be the rapid and powerful action of the intelligence that resides in every passion of the soul. Each faculty seems to be a combination of desire and intelligence, with powers of foresight and memory. The reflective powers, Comparison and Casuality, by which we discover the harmonies of relation and sequence, and the general "fitness of things," are the calm judges that must give final decision; but what is called the instinctive knowledge of right may be the intelligence of Conscientiousness. So Constructiveness, or what is called the propensity to build or construct, seems to carry with it in insects, birds, and higher animals, as well as in man, certain powers of intelligence and action; and I can conceive of no passion which is not accompanied by a kind of intelligence suited to its nature and objects, giving us the knowledge called instinctive or intuitive, and which, though liable to many perversions, is, in a true life, perhaps more reliable than the action of the so-called intellectual powers.

How a mass of grey and white matter, 95 per cent. water, made up of cells and tubes, a pulpy, almost liquid substance, in which it is difficult to trace organisation, can be the organ of feeling and thought, and the wonderful powers of perception, memory, and imagination, is quite inconceivable. The action of muscles and bones in locomotion is mechanical and obvious enough—but how the impulse to move, and the skill to write, or play on a musical instrument, acts in the soft matter of the brain, and is sent down the nerves, we can have no conception.

There appears to be an element which some have imagined to be electricity, or an analagous substance or force, which connects what we call spirit with what we call matter. There appears to be a nervous aura pervading and surrounding the body; passing off by voluntary action in what is called magnetising, or mesmerising, in the fascination of serpents, and not less in men and women who have the power of charming; and which may be the medium of supersensual powers which we call psychometric, intuitive, gifts of second sight, prophecy, and gifts of healing.

That what we call spirit can act on what we call matter, we have proof in every organised being. There is no greater miracle in this way than ourselves, when, for example, a thought or memory moves our muscles, or causes a secretion of tears; but we have now a vast accumulation of facts, which prove that the spirits which have become entirely independent of material organisation, can, under certain conditions, act upon not only living souls, but upon dead matter.

There are many thousands of persons of unimpeachable character for intelligence and veracity, who are witnesses of this class of phenomena. Raps are made of various intensity, from a slight and almost imperceptible crackling sound, to loud sonorous vibrations, which can be heard over the house, and produce a sensible jar around them. When questioned, these raps answer with an intelligence which shows that they are produced by invisible beings. Sometimes the physical demonstrations are of a very powerful character. Heavy tables are raised from the floor, or tilted from side to side, without disturbing the objects upon them. Musical instruments are played upon without visible hands. Persons are raised bodily from the floor, and carried through the air, contrary to all received notions of the laws of gravitation. Often the

messages from friends who have passed from this state of existence, give the most striking proofs of identity; but whether such proofs are ever beyond question or not, there is abundant evidence of the existence and action of invisible intelligences.

There seems to be no reason for disputing the facts. I have not stated one to which I could not summon hundreds of witnesses, the oaths of any two of whom would send a man to the gallows. The theories invented to explain the phenomena upon other hypotheses than the existence of spirits, are very unsatisfactory. The simplest way is to accept the explanation of those who avow that they are the real agents in producing these effects. All the other explanations yet attempted are absurd. I can readily believe that there is much delusion connected with pretended spiritual agencies; and I see no reason to believe that spirits are more infallible out of the body than in it. Admitting these facts, we have proof of two things—of spiritual existence, independent of our present material organisation; and of the power of spirit to act upon even the gross forms of matter, through certain media, or with the presence of certain aromal conditions.

In our present organisation, the soul appears to act both independently and through the finer matter of the brain and nervous fluid, upon the bodily organs. Each faculty and passion of the soul has its own special organ, over which it presides as a soul; and as with the organs of the body, the individuality of these organs is consistent with perfect harmony, and their harmony produces individuality.

While the cellular surface of the brain seems to be the seat of the soul, its internal portion is made up of connecting fibres. The base of the brain appears to be the seat of sensation, where all external impressions are received. Here centre the nerves of sight,

hearing, taste, smell, and the wide and varied sense of feeling. These sensations, it is supposed, are conveyed to their appropriate cerebral organs, where they become perceptions, and the food of thought, sentiment, and passion. The rays of light, passing through the crystalline lens of the eye, form a perfect camera obscura picture upon the retina; and the optic nerve conveys the idea of that picture to the mind. The perception *may* take place in the retina itself; for the nerve may as well convey a perception as the impression of which that perception is made. Vibrations of the atmosphere, striking upon the drum of the ear, produce impressions upon the complicated apparatus of hearing of all appreciable varieties of sound. The powers of these instruments are truly wonderful. The eye seems more simple than the ear, and we come nearer to understanding its beautiful mechanism; but the result is, in both cases, a mystery.

The senses of smell and taste seem to be very simple modifications of the great sense of touch. Atoms of matter come in contact with the olfactory nerve, and we have the delights of smell. Savours, mingling with the moistening saliva of the mouth, come in contact with the nerves in the papillæ of the tongue, and we experience the pleasures of taste. These are two sentinels set to guard the avenue to the stomach; and to see that no impure thing finds entrance to the sanctuaries of organic life; for as the organic nature supplies strength to the animal, it is the duty of the animal to watch over and protect the organic.

The sense of feeling pervades the whole body, and even the organs of the other senses. We cannot only taste with the tongue, but we receive by it sensations of form, size, roughness or smoothness, heat or cold. So the nose can itch, or smart, or tingle, as well as distinguish odours. The surface

of the eye is the seat of the most acute sensibility. We feel everywhere with the nerves of the skin, but especially with the ends of our fingers. This sense has relation to many faculties and passions. Things feel hot or cold, dry or moist, smooth or rough, slippery or the reverse, sharp or dull, hard or soft, rigid or pliable, regular or irregular, circular or angular. In some organs a modification of the sense of feeling gives exquisite pleasure.

"There is a natural body, and there is a spiritual body." If an informing soul builds up, animates, makes use of this body, with all its organs and senses, then the spirit, or spiritual body, must consist of the soul or *sub-stance* of the natural body as a whole, and also in every minutest part. If we have a spiritual head, we must also have spiritual hands and feet. We must have spiritual eyes, ears, noses, mouths, tongues, teeth. And, if these, we must have spiritual brains and nerves; spiritual blood, heart, arteries, lymphatics, spiritual lungs, liver, kidneys, bladder; spiritual food, secretions, and excretions. I consider this existence of man, future and immortal, a proven fact; and if he exist, it must be in some form, and with some organisation. He exists as a living, thinking, acting, enjoying being. And our only possible conception of him is as the same identical spiritual being that we now see him, only that the material organisation, or the natural body, seems to be the necessary condition of a certain stage of spiritual life, and when that stage is passed, it is no longer needed. An early death is, therefore, a great misfortune, though it may often save one from greater evils; and life may be too long when the soul is imprisoned in an organisation no longer fit to perform its functions. How affecting, and yet how natural, are sometimes the longings of the aged to be set free from what they feel to be clogs of mortality! The dread of death in the young, and

the longing for death in the very aged, are equally natural.

The soul finds its normal expression, in this stage of life, by means of the nerves of motion and their organs, the muscles. By their means the soul walks about, runs, climbs, gathers food, builds dwellings, gathers and creates objects of use and beauty, which constitute material riches. By their means the soul laughs in her hilarity, exults in her joy, glories in her triumphs, or weeps over her misfortunes. And every passion and faculty of the soul finds expression in this outward action, the force of which is conveyed by nerves, and acts upon the muscles of animal life. They also, as we shall show, have a powerful influence over the organic system.

Thus the faculty of tune finds expression, through nerves and muscles, in the production of vibrations of air, as it passes through the larynx—the most simple, and, at the same time, the most perfect of all musical instruments. Guided by the sense of hearing, and aided by other intellectual faculties, this passion for music also finds its expression by means of various instruments; and the art of music produced by so complicated an organism, becomes itself an expression of many other passions.

So all faculties, all feelings, all passions of the soul, find their natural expression, or natural language, in movements, gestures, signs, language, all of which are accomplished by the nerves of motion, originating in the nervous centres, and imparting their stimulus, or motive force, to the muscular system.

If I read to myself, there is sensation, perception, and thought—perhaps emotion or passion. But if I read aloud, there is added to these a complicated process of nervous action and muscular motion. Some of the best examples of these combinations of mental and physical action, may be found in the earnest

orator, or the impassioned actor, whose whole being is controlled by the direct influence of the passions he has the power of calling into temporary action; the great singer, who overcomes the most astounding difficulties of vocalisation, and impresses us with all the emotions the composer intended to convey; the accomplished violinist or pianist, who effects the same with his fingers upon an artificial instrument; the artist, who flings the expression of beauty and passion upon the canvas, and fastens it there for centuries.

The apparatus by which these effects are produced is complicated and obscure, both in its structure and its action. The nerves of motion which govern the movements of the muscles of the face, eyes, tongue, etc., pass through several openings in the base of the cranium; but they have their origin in the upper part of the spinal cord, or medulla oblongata; and are connected with all parts of the cerebrum and cerebellum. The nerves of motion, that supply the trunk and extremities, are given off in pairs from the spinal cord, and seem to have in that continuation of the brain nervous centres which supply them with the power of action, though their movements are usually under the control of the will. This, however, is not always the case. There are involuntary actions, both constant and occasional, which seem to centre in the grey matter of the spinal cord. Respiration, performed both by the muscles of the chest, and the diaphragm and abdominal muscles, goes on from the beginning to the end of life. It may be controlled by the will, but does not depend upon it. The sphincters of the bladder and rectum are also in constant action. The muscles of the pharynx, employed in swallowing, act the moment any substance passes the fauces. So of the acts of coughing, sneezing, and, to some extent, that of laughing. Many of these acts are performed when the brain is quiet in sleep, or in a state of

coma, or apoplectic insensibility. The spinal cord is the brain of the body; and it is questionable whether all voluntary actions are not of a secondary character, prompted by the brain, and then executed by the spinal cord.

Many physiologists believe that one of the functions of the cerebellum is to combine and harmonise muscular motion. There is little doubt that the organs of the brain form a perfect society, arranged in series and groups, acting together, in a normal state, in perfect harmony, and carrying out their impulses by the best possible adaptations of organism. A central, combining, regulating, and harmonising power may well reside in the cerebellum, which is an organ of the most beautiful and complex character, and a source and reservoir of power and energy.

According to our use of the word soul, it may be applied to every being that is gifted with sensation thought, passion, and volition. It is the spiritual principle of animal or sensitive life; and there is also a lower soul or animating principle of organic life which belongs both to vegetables and animals. The brains of animals, far down the scale of being, are like those of man. There is the same kind of grey cellular matter, and white fibrous; nerves of sensation and motion; organs of sense, and organs of motion an animal system super-imposed upon the organic.

The higher animals have the same senses as man some in greater, some in a lesser degree of perfection The sensations, of which these are the instruments intellectual perceptions, moral feelings, passions, and propensities, seem to differ very little from our own Animals have also their own varied modes of expressive action, which, in many cases, are similar to ours. The dog has many of the intellectual faculties of man; his sensations are acute, and he does not lack in expression. He has memory, and often show

a good judgment or power of adapting himself to circumstances. He is proud, vain, benevolent to men, and to his own species, faithful to trusts, firm in his friendships, very affectionate, cheerful, playful, courageous. He even appears to possess a remarkable degree of impressibility and foresight. He has a perception of things invisible to us, and of approaching dangers. He dreams. He very evidently understands our words, and seems often to divine our thoughts.

These are psychical powers. In man, we call them spiritual—what shall we call them in the brute? Insects, birds, and the mammalia exhibit similar faculties of mind or soul. The elephant is, in his moral and intellectual character, perhaps even superior to the dog; and he owes less to the companionship of man. In clearness of apprehension, calm judgment, tenacity of memory, benevolence, and affection, and many valuable qualities of mind and heart, he compares favourably with many of our own species.

What can we infer respecting the soul, or spiritual principle that presides over the material organism of the dog or elephant? If we admit, as has been sometimes urged, that soul is indestructible, and therefore immortal, we must give these animals immortality. If an existing individuality can never be destroyed, what becomes of individualities of so striking a character? It is important that we understand our true relations to the animals; and it is a grave question how far we have a right to enslave, mutilate, torture, murder, and devour them.

NOTE.—In speaking of the intellectual and moral faculties of animals, I have used the words in their common or phrenological, rather than their philosophical or theological, meaning. There are evident, however inexplicable, differences between the mind and soul of man and the faculties of the highest of the brute creation.

CHAPTER VII.

THE FUNCTION OF GENERATION.

THE generative function has for its special use the continuation of the species; and it is intimately connected with the highest processes of both the systems of organic and animal life. There is no action of the body, and no power of the soul, which does not enter into the complicated and beautiful process by which humanity exists, and new beings are created. For the performance of this great function, we have a peculiar power or passion of the soul; special organs in the brain; nerves of exquisite sensation; voluntary and involuntary nerves of motion, with their muscular apparatus; and the most complex organs of innervation, circulation, nutrition, and secretion, connected with the system of organic life. Through all her works, nature has taken peculiar care of this function, often raised it above all others, and sacrificed all individual interests to the general welfare.

To do justice to a subject of so much scientific interest, and having such important relations to the health and happiness of man, I must treat it with entire freedom. I write for those, and those only, who are ready to accept the truth, and who desire to live it. I must also give more space to its consideration, than to topics which may be found elsewhere satisfactorily elucidated.

In the inorganic world, there is deposition, accretion, aggregation, but no such thing as generation. Minerals do not produce after their kind. But the moment we pass the line which divides inorganic from organic nature — the moment we come upon the domain of life we have processes of reproduction.

The simplest vegetable cell, at a certain period of its growth, divides itself into two similar cells. Other cells produce smaller cells within their walls, and then, at maturity, dissolve, and set the young cells free. A little further on, and in more complex organisms, we have what is called the gemmiparous reproduction. A bud, separating from the parent stock, becomes an independent plant. This last process is found pretty high in the scale of vegetable life, and is often coincident with higher forms of generation. In propagating many plants we may either use a slip, or a tuber, or the seed. The lower orders of animals propagate their species in the same way as the lower forms of vegetables. In animalculæ, we have divisions and gemmations, or the throwing off of buds, as in vegetables.

We now come, in both the vegetable and animal world, to more complex organisation, and higher methods of propagation, and find two principles uniting to form a living embryo. In the vegetable world, nature has surrounded the generative function and the sexual apparatus with the most attractive qualities. In some animals, and in most plants, the process is performed by the male and female organs in the same individual; but in some plants, and all the higher animals, we have the two sets of organs necessary to the result in two bodies, male and female.

In all cases, in this mode of generation, we have this simple fact. There must be formed an ovum, or egg, which is, in its essential part, a cell of microscopic minuteness; and at a certain stage of its evolution, this egg must be fecundated by the addition of the male principle. The masculine and feminine elements unite to form the perfect germ of a new being.

It is remarkable, that the parts of plants devoted to

the sexual function, are those we most prize for their beauty and fragrance. It is the flower of the plant which contains the generative organs. The centre of the flower—the home of beauty, and fragrance, and sweetness—is the nuptial couch, the bower of love, sacred to the mysteries of vegetable procreation. In the centre of this bridal chamber is the pistil, or female organ; its tube corresponds to the vagina, and below it is the ovary, where the egg is formed and fecundated. This is done by one or more stamens which surround the pistil, and which have the power of secreting the spermatic fluid, which, in the form of pollen, falls upon the stigma of the pistil. The stamen corresponds to the generative organs of the higher male animals. In some plants, as the Indian corn, the sexual organs are further apart. The male, or sperm-preparing organs, are at the top of the stalk, while the female organs are midway. The pollen from the "tassel" must fall upon the "silk," or there will be no corn. In other cases, the male and female organs are on different plants of the same species, and the pollen from the male plant is brought by winds or insects to the female flowers.

In like manner, there are animals which contain in themselves both male and female organs. In some, the ovaries and testicles are near each other, and they have the power of self-fecundation. In others, each individual performs the part of both male and female to some other of its species.

But in the higher animals, and in man, there is no such hermaphrodism. The sexes are distinct, and the possession of one or the other set of organs, and the capacity of performing one or the other of these processes of the generative function, make the striking differences between the two sexes.

In my brief sketch of anatomy, I have described, with some minuteness, the more obvious and external

features of the two sets of generative organs. I have now to give a more thorough and physiological account of this function and its relations. It divides itself naturally into three parts:

1. The passional, or that connected with the soul, and having its nervous centre in the cerebellum—the amativeness of the phrenologists;

2. The sensational or active, connected with manifestations and the sexual congress;

3. The organic, or the evolution of germs and spermatozoa, in the ovaries and testicles, and the progressive evolution and final expulsion of the fœtus.

The order in which we treat of the three divisions of this subject may not be very important; but, after what I have said of the nature of the organic process in plants and the lower animals, I prefer now to begin with the higher passional sphere, and descend through manifestations and results; though, as will be seen, in this, as in all the other functions of man, these are intermingled and reciprocally act on each other.

The passion of love in our earlier years has what may be called a rudimentary development. In very young children we perceive signs of the sexual instinct. It is naturally shown in a gallant fondness which little boys have for their mothers, their older sisters, and generally for the female sex. At the same time, little girls have a peculiar tenderness for their fathers and male friends.

The cerebellum, which Dr. Gall has proved, by many observations, to be the seat of this passion, is usually small and immature in childhood, corresponding to the state of the feeling, and of its special organs; and it is not until the age of puberty that all the organs are developed together. But as there is a rudimental activity in the passional sphere, there is also, in many cases, some excitement in the organic. The boy, before he reaches his teens, has his imagination

excited with ideas of sexual pleasure; and his immature organs partake of this excitement. If, at this time, he is so unfortunate as to find the means of gratifying his propensity, he runs the risk of forever disordering, or even destroying his virile powers, and of wrecking his whole mental and bodily constitution. With the young girl, the danger is equally imminent. Her passions are as strong, and her power of gratification even greater. If, in maturity, some women seem to have the capacity for greater and more frequent enjoyment than men, in childhood a far greater number destroy all desire, and all power of enjoyment.

There are some children, born of parents with disordered amativeness, who inherit passional activities, and organic excitabilities, which hurry them to swift destruction. Mere infants, both male and female, fall by a perverted instinct into habits of masturbation. This is not simply a vice; it is a disease. I do not say that all vices are not of the nature of disease; but this early propensity to the use, and consequent destruction, of the sexual organs, is a special disease which demands earnest sympathy and prompt attention for its cure.

In a normal condition, there is considerable excitement of the reproductive system on the approach of puberty. This period comes, in boys, at the age of fifteen to seventeen; in girls, from thirteen to fifteen; and later or earlier in exceptional cases. Boys and girls, as they approach this age, are full of romantic sentiment, which expresses itself in profound sighs, in a sweet melancholy, a love of solitude, and in idealisations of adored, rather than beloved objects.

It would seem, from the experience of many persons, that the most natural love of a youth of fifteen, is a mature woman of twenty-five or thirty; and that the affections of a girl of a corresponding age, are most likely to be bestowed upon some mature man. At a

later period, men love women of their own ages, and still later, they respond to the affections of those who are much younger than themselves. Such loves, at this period, are the most suitable that can be formed, and the least dangerous. Youthful ardour and impetuosity are tempered and guided by the wisdom of experience; but where two very young persons are thrown together, their passions are liable to burn out themselves, and leave but cinders of their possessors.

The first love of either man or woman, eternal as it may seem to them, is not usually lasting; and if an effort is made to compel it to constancy by the bonds of marriage, it often proves a disastrous experiment. Left to itself, the illusion vanishes, or the love settles into a calm and beautiful friendship.

When the period of puberty has fully arrived, there comes a wonderful change over the whole being. No after change, till death itself comes, is so rapid and important. Soul and body expand with new powers and new feelings. The boy finds a beard sprouting on his chin, and hair also springing on the pubes. His neck increases in size by the expansion of the cerebellum behind, and the larynx in front. With the expansion of the larynx, his voice sinks a full octave in its pitch. The organs of generation increase in size and excitability; and with idleness and luxury, there come voluptuous thoughts by day and dreams by night, with extreme danger of solitary or social gratification of the sexual instinct, which may be a cause of disease, impotence, epilepsy, insanity; and, in any case, of life-long regrets. The remedy is to know and guard against the danger, and to keep a perpetual activity of body and mind, with great temperance in food and drink. If all the forces of life are used in bodily exercise and mental culture, the great dangers of youth may be escaped.

Puberty, in the girl, brings no less remarkable

changes. There is no beard upon the face, but hair begins to cover the mons veneris. The larynx does not expand, nor the voice deepen, but the cerebellum, though always smaller than in the male, increases in size, and the body expands into the full mould of womanly beauty. The pelvis enlarges, giving breadth to the hips, and a graceful swing to the carriage. The mammary glands enlarge, producing in all healthily developed girls the beautiful bosom which sculptors and painters are never tired of showing us, which fashion exposes and modesty conceals. But the most striking change that takes place when the girl becomes a woman, is the commencement of a monthly discharge from the uterus, through the vagina, coincident with and dependent upon the ripening of the germs in the ovaries, and their periodical expulsion.

Both sexes are now apparently fitted for the performance of the sexual function. In the male, the testicles have secreted the spermatic fluid, and elaborated its vital part, the living spermatozoa; the seminal vesicles are filled with this fluid, ready to be discharged. In the female, the ovaries have begun to bring forth the ova, which contain the germs, which only require the presence of the spermatic fluid to be developed into human beings.

What now is the order of nature at this period? Her work, in the reproductive function, is begun, and goes on, month after month, in the female, and continually in the male. Every month, one or more eggs are thrown off from the ovary, pass down the fallopian tube, lodge in the uterus, and if not fecundated, perish, and are expelled as abortions. At the same time nature is forming, in the testicles of the male, millions of spermatic animalcules, any one of which might effect the fecundation of the extruded ovum.

Before we mourn over this sad seeming waste of

the elements of life, let us send through nature a glance of inquiry. How large a proportion of the early blossoms on our fruit trees never ripens into fruit! How many millions of the seeds of plants become the food of animals, and never carry out their design of reproduction! Of the millions of eggs which come from a single fish, how few ever produce young! Why should there be millions of spermatozoa in a single discharge of the spermatic fluid, when it is probable that only one can ever act upon the same ovum?

Nature is bountiful. Nature is prolific. Especially in relation to this function, nature has everywhere dealt with a liberal hand. Puberty in woman begins at fifteen, and the monthly evolution of ova continues till fifty, when the function ceases. If she has but a single egg each month, she produces four hundred and twenty. But many women throw off two, and even three, four, or five at a monthly period. Twins are not unfrequent, and in rare cases three, four, or more children are born at once. Thus, a woman who lives in single blessedness, may have produced and wasted the germs of a thousand human beings. But it is evident that most of this seeming waste is quite orderly and intentional. When a germ is fecundated, or impregnated by the presence of the masculine secretion, the production of germs is suspended during the nine months of pregnancy, and usually also during the whole period of nursing. A perfectly healthy woman, living in natural conditions, will thus have a child once in two years during the period of child bearing.

The activity of the generative organs in both sexes, the constant production of the spermatic fluid in males after the age of puberty, and the periodical production of germs by the female, has made some ignorant people imagine that there should be a corresponding exercise of the sexual organs—that the union of the

sexes should begin at puberty, and continue through life; but this is an evident absurdity. For several years after puberty, neither the male nor the female has arrived at sufficient maturity to produce healthy offspring. During gestation and lactation—pregnancy and nursing—all physiologists are agreed that sexual union is unnatural, and injurious to mother and child. Finally, the capacity for producing germs, and consequent child-bearing, ceases in women at the age of forty-five to fifty-five, while men have the procreative powers to a much later period.

It is evident that the early activity of the generative organism is intended for the perfection of the individual, and not for the continuation of the species. Love ripens and expands the soul, and its organic elements give breadth, firmness, and vigour to the bodily organs. Love diffuses through the mind warmth, enthusiasm, energy, the elements of genius, and gives an inexpressible charm to the feelings of the heart. All that is brave, noble, generous, heroic, and all that is sweet, voluptuous, tender, and endearing, spring from the influence or the sentiment of love.

When this sentiment is undeveloped, when the cerebellum is small and inactive, and when the generative organs are lacking in energy, the whole character suffers. It is cold, heartless, selfish, unfeeling, and wanting in the generous impulses and enthusiasm. And whatever be the cause of this lack of development or activity, the effects are nearly the same, and afford the most convincing proofs of what we have stated to be the proper influence of this wonderful faculty. If the development of the cerebellum is checked by the removal of the testicles in the male, or the ovaries in the female, at an early age, we have the most striking results. In the male, the beard does not grow, nor the hair upon the pubes. The larynx does not expand, and the voice retains the high treble

or contralto pitch of boyhood. The operation of castration was formerly employed in Italy for this purpose. The muscles remain soft, and there is a tendency to fatness and effeminacy in the whole aspect. The mental and moral character is of a corresponding emasculation. There is feebleness, coldness, selfishness, cowardice, and a general lack of all we convey by the word manhood.

Now, similar effects are produced by early habits of masturbation, or self-abuse, and also by early excesses in sexual indulgence.

The effects of a similar check of development upon the female are equally remarkable; but, in some respects, the reverse of the above. Love, that makes men manly, makes women womanly. Where there is destruction of the ovaries, or arrest of development, either of the ovaries or the cerebellum in girls, they grow large and coarse. The pelvis does not expand. The hair upon the pubes is thin and straggling; the bosom remains flat; a thin beard covers the chin; not the rich down that sometimes gives a more voluptuous softness to the female lip, but a scraggy, straggling, half masculine beard; the voice becomes rough and masculine, and the whole appearance is that of an ambiguous being, neither male nor female, but partaking of the nature of each. The character, also, is cold, repulsive, rude, selfish, and cruel: the reverse of the truly feminine nature.

And in woman, as in man, similar effects are produced by any arrest of the development, or any exhaustion of the sentiment and organism of love; but excess, which exhausts the other powers, and disturbs the harmony of the system, may only produce great and diseased activity of Amativeness; when we have different effects from those which attend upon its destruction.

There can be no more powerful illustration of the

proper influence of the generative function over the animal and organic systems than those we have just given, and we have such illustrations, in a greater or less degree, all around us. No nature can be blessed with any quality so noble and ennobling as a healthy development of the principle of love. No nature can be so cursed as by its destruction or deprivation. All that is great, and noble, and beautiful in human character or capacity, or destiny, rests upon this basis. All that is base, and mean, and miserable, may find its source in the want, or disease, or perversion of this principle.

And the first effects, as I have said, of this influence are, as I believe, intended to be shown in the development of the individual, and not in the continuation of the species. The nervous power that is generated in the cerebellum, in man, and which is expended in the production of zoosperms in the testes, if not exhausted in their expulsion, and by their loss, is thrown back into the system, and strengthens every part. It is a fountain of life and energy; a vital force, which acts in every direction; a motive power, which infuses manhood into every organ of the brain and every fibre of the body. It is like the vital heat that warms the whole body, and then warms bodies around us, and which must not be exhausted.

Nature, under favourable conditions, has provided for this mode of action. Youth is the season of enterprise and action. The constitution is developed by hardy exercises, and the mind by studies. There is a restless and eager desire for knowledge and variety of occupation. And love is yet more romantic than passionate, more ideal than actual. It dwells in the imagination, and should not descend into the senses. So the nervous power, generated in the cerebellum—the divine energy that reigns in the soul—perfects the whole nature, and thus fits it for the mature accomplishment of its final object.

And in woman, while the organic action of the ovaries goes on, in the production, ripening, and throwing off of germs; if there is no expenditure of nervous force in sexual pleasure, no fecundation of the ovum, and consequently no evolution of the fœtus, her vital force is also expended in mental and physical development, and in fitting her for the functions of love and maternity, for which she is not well prepared until the accumulation and action of this force has brought to her a certain degree of maturity. The early germs in woman are less fitted for fecundation than those which appear later; and the zoosperms which are produced by the male in the first years of puberty, have less power in the production of healthy offspring. There is no doubt that the first activity of the generative function should be expended in energising the individual rather than in the propagation of the species.

The passion of love, or the propensity of Amativeness, varies in the sexes, and in individuals of each sex. No two persons look alike; no two feel alike; nor, unless under compulsion, can they act alike. They may act in harmony; but harmony is not unison. Where we can find two persons in the world with the same form, features, and expression, the same development of faculties, in the same proportions and relations, we may expect them to feel and act alike, and be governed by the same rules.

In certain respects all men are alike; but their likeness is consistent with an infinite individuality. In certain respects the faculties and passions of different individuals are alike; but in others they very notably differ. How varied are the tastes and capacities connected with the organ of Tune! One person can only understand the simplest melody; others revel in complicated harmonies. Alimentiveness in one man tends to the desire of a single delicacy; another seems omnivorous. In Art one is fond of portraits, another

of landscapes; one delights in the simple and severe, another loves the ornate and luxurious. Observe the various tastes in dress, when fashion does not compel everybody to follow a particular standard. In religion, in ambition, in pride, in friendship, in all faculties, sentiments, and passions, we have these varieties of individuality, necessary to the perfection of social harmony. Shall we deny to the great passion of love, and the great function of generation, the same individuality and the same variety?

The passion of love, as it reigns in the soul of man, harmonising and energising his animal and organic systems, has three general modes of expression.

1. It gives a feeling of regard for the whole opposite sex. It inspires in man a gallant respect for woman; in woman, a tender regard for man.

2. In a circumscribed sphere, it is social in its character and action. A man has for the women of his acquaintance, whom he meets in society, and with whom he is on terms of kindly familiarity, a very different feeling from any he entertains towards the other sex. Women and men, with no bond of personal love, still have a more cordial feeling toward each other, than they commonly have toward persons of their own sex. This is seen in families, in society, and in schools where both sexes mix freely together. But under the customary repressions of fashion, and opinion, and puritanism, we find men and women driven into false and unnatural connections with those of their own sex —yet even here we see masculine natures attaching themselves to feminine, and everywhere the action of the great physical and moral law—unlike natures attract each other—like natures repel.

3. Personal love, beginning with a spiritual attraction, becoming voluptuous desire and seeking its ultimate expression in sexual union. This is the last, fullest, and most perfect action of the amative passion;

that which consummates the life and happiness of the individual, and governs the destiny of the race.

Reproduction in the vegetable world is, in the higher organisations, as distinctly a sexual process as among animals; and in the flowers, or sexual organs of plants, we have a great variety of relations, from the union of a single stamen and pistil, of a pistil with two, three, four, or almost any number of stamens, or several pistils receiving their pollen indiscriminately from a number of stamens. Vegetables are monogamic, polygamic, and polyandrous. (See any work on botany, or read Darwin's "Loves of the Plants.")

In animals, again, we have all varieties of sexual relations. Some are entirely promiscuous, any male fecundating any female. Then we have the polygamic relations which exist among fowls, seals, and other gregarious animals, in which one male has a harem of several females, who are made his by his own attraction, or the right of the strongest. On the other hand, we see female animals, especially those who produce several young at a litter, receiving successively the embraces of several males. The queen bee, the only perfect female in the hive, has for her service two or three hundred drones, whose sole office is the fecundation of the eggs, which are to produce her numerous offspring. On the other hand, one ram is sufficient for a large flock of sheep, one bull for a herd of cows, and one stallion for a number of mares.

Many animals, however, are monogamic. Most of our birds copulate in pairs, and are capable of ardent and exclusive affections. Elephants are found both in pairs and in herds; monkeys pair, but are not exclusive in their amours. The wolves seek each other only once a-year, and cohabit promiscuously. The only one of all the species of deer that is constant, is the roebuck. An abundance of facts, to be found in any good work on natural history, illustrate

the varieties of this action of love in the animal races.

In the human species, the love relation exists in such variety as might seem to indicate, what many believe, that man includes in himself the nature of all the lower animals. In the early ages, and what are called the patriarchal times, polygamy seems to have been the unquestioned practice. It is now tolerated by law or custom over three-fourths of the world, and is practiced to a great extent over the other fourth.

Polyandrous relations, or the union of one woman to several men, under the sanction of law or custom, is more rare; but there are not wanting examples of this. In Thibet, in Malabar, in the South Sea islands, it is allowed to a woman to have two or more husbands; and, in point of fact, this is practiced to some extent over the civilised world. In some of the most polite countries in Europe, custom has sanctioned women of the higher classes having a lover as well as a husband; and such relations exist, and are more or less tolerated everywhere, while men are still more free in their ideas, and promiscuous in their indulgences.

If we examine the society around us, we shall find persons of varied creeds and practices in the sexual relations.

1. Strict monogamists, who believe in a single love, which endures through all time and all eternity. This belief does not admit of one love succeeding another, much less two at the same time. A second love is profanity, a second marriage adultery. Yet persons zealously avowing this belief, are found engaging in a succession of amours. Their excuse is, that in each case they have been mistaken. The person supposed to be the true conjugial partner, the heaven-appointed mate, proved not to be the right one. They have nothing to do but to go on trying, atoning for each

successive adultery, by their efforts to find a true relation.

2. Moderate monogamists, who allow of a succession of love relations, but do not admit of but one at a time. This is the ordinary view of marriage, in which the bond can only be dissolved by the death of one of the parties; or by such an outrage against the relation as is equivalent to death, such as adultery.

3. There are those who believe in a central or pivotal love, transcending, and perhaps outlasting all others; but around which may revolve other loves, affections, or fancies, not inconsistent, but entirely harmonious with, the prime and pivotal relation.

Observation shows us that there are men capable of a single love, whose intensity absorbs and exhausts their whole passional nature, and the same is probably oftener the case with women. This is the love we read about in poems and novels, but see rather less of in real life.

Men who have romantic fancies in boyhood and early youth, and violent love fits in early manhood, which give place to calmer, stronger, and more enduring loves in their maturity, may be exclusive or monogamic; or, with more varied and expansive natures, strong loves may be consistent with subordinate affections, desires, and gratifications. These differences in exclusive intensity, or expansive variety, extend to the whole character, and a man or woman of a wide range of capacity or genius, who is capable of alternations, and even of doing many things at the same time, may be expected to have a like capacity in love.

Men who combine weakness with versatility; who go equally in every direction, but strongly in none, are likely to be unsettled and promiscuous, either to change continually, or to have a disorderly variety. These are not pivotal characters, nor are they capable

of an exclusive attachment. In this latter class, we have a vast number of men, and not a few women.

Theoretically, in Christian states, the monogamic principle of the union of a single pair for life is adopted; but this principle is widely violated in practice. This monogamic union is the legal marriage, from which, in some countries, there is no divorce; in others, divorce is allowed on the ground of adultery, and, in some states, for desertion, ill-treatment, drunkenness, and various causes.

Marriage, according to the common acceptation, is the legal union of a man and woman, who, from any motive, have agreed to live together in exclusive cohabitation. Adultery is the violation of this compact by either party.

Marriage, in a higher and purer sense, is the union of two persons in mutual love; and adultery is, perhaps, best defined as any gratification of mere lust, or the sensual nature, without the sanctification of a true love, and apart from the lawful uses of marriage. According to these definitions, a true marriage may be what the laws call adultery, while the real adultery is an unloving marriage.

The Catholic Church teaches that marriage is a sacrament, and therefore it does not permit divorce, but only separation; neither party being allowed to marry again until the death of the other. It is literally "until death do us part."

In plants there is but one act of impregnation, by a single organ, which occurs at what may be called its season of puberty. Its office performed, the useless organs wither. The whole flower drops off, when its function has been performed. Some plants produce but one set of generative organs, and then the whole plant perishes. These are the annuals. Others go on producing flowers and buds year after year. These are the perennials.

There are many of the lower varieties of animals which perform but a single act of generation, and then die. The higher animals continue the process through many years. As a general rule, the lower the animal in the scale, the more prolific. A fish produces millions of eggs; the higher mammalia seldom have more than one at a birth. Some breed in litters every few weeks; others require two or three years to produce and suckle a single offspring.

In the females of most animals, there occurs a period in which they are ready to receive and solicit the embraces of the male. This is called the period of heat, or the rutting season. It is that in which the ova are ripened, and cast off from the ovaries, and when the sexual congress is demanded for their impregnation. This period, which in animals is more or less frequent, according to their periods of gestation, corresponds to the periodic menstrual evacuation in the human female.

The males of animals differ with respect to their readiness for the performance of their part in the sexual function. In some, the feeling seems not to exist in the intervals, and the testicles are shrunk and inactive; but when the rutting season of the female arrives, as it usually does in the spring, these organs enlarge, secrete with vigour, and the animals seem filled with a fury of desire. The stag, usually gentle, is at this time fierce and dangerous; but in animals where the periods are frequent, or where one male encounters many females, the organs are always in an active condition, and the male always ready to perform the duties which nature has imposed upon him, and to enjoy the pleasures which she gives as a reward. But it must not be supposed that pleasure is the only attraction. The instinct of reproduction is above all mere sensual gratification. It is by no means certain that this act is always one of pleasure to animals, while, in our own species, the sexual congress is often to the woman either entirely

indifferent, or painful. Gestation is to many a long disease, and parturition a death agony. Still, the desire for offspring triumphs over these terrible perversions.

In animals where there is but one gestation in a year, there is usually but one period of heat; but while the periods of gestation and lactation extend over nearly two years in the human female; when these are at an end, she regularly, every month, throws off an ovum, marked by the menstrual discharge; and, of course, is every month prepared to receive the sexual embrace. It seems to be fairly inferable, that once a month is the natural period in which a woman requires sexual union; and it may be doubted whether any greater frequency is not a violation of natural law. At this period, however, when in a healthy condition, she is full of ardour, has a great capacity for enjoyment, and is seldom satisfied with a single sexual act. The period of excitement, moreover, may last for several days, or all the time the ovum is passing from the ovary to the uterus. Once there, it should not be disturbed by any amative excitement, whose tendency from that time forward, is to produce abortion. It is the law of all nature; a law that is said never to be violated even among savages, out of Christendom, that there should be no sexual union during gestation. It is not permitted among animals, and over three quarters of the world is looked upon as infamous in our own species. It is also inconsistent with the performance of the function of lactation or nursing; and no woman, mother or wet nurse, who gives milk to a child, should be subjected to sexual intercourse. This is one reason why women, who do not nurse their children, because their husbands will not refrain from sexual indulgence, try to get unmarried mothers as wet nurses for their babes.

And sexual intercourse during pregnancy is a disturbance of that function and an injury to mother and

child, especially if the female partakes in its enjoyment. It is the most common cause of abortion and miscarriage, and increases the pain and danger of childbirth. No woman naturally seeks union at such period: no woman can safely submit to it. What should we think of any animal but man, which should do as he does in these matters? I see no physiological reason why a woman should desire sexual union, after pregnancy, until her next menstrual period, which will not normally take place until she has finished nursing.

Man differs very materially from woman in the exercise of the procreative function. From the age of puberty, the action of the testes is uninterrupted. I can find no hint of periodicity, unless it has been created by habit. Whatever restrains he may have, must be moral; for they are not physical like woman's. And while, in woman, the production of ova ceases at from forty-five to fifty-five, the activity of the organs in man continues, and he is capable of generating until a late period of life, and in some cases when more than a century old. Man has no function corresponding in periodicity to menstruation; no diversions of the vital forces engaged in this function, like those of pregnancy and lactation. But in this function man must be governed by the requirements of natural law, which is the basis of morality. And the law is that he should respond to the feminine requirement, and never go beyond it. This is the law throughout the animal creation, and to it man is no exception. Woman was not made to be a harlot for man, the instrument of his pleasures, in marriage or out of it. Sexual union is for birth, and to be had when the pure, unperverted feminine instinct demands it; never for mere sensual gratification, and assuredly never when it may defeat the very end it was intended to accomplish.

The influence of the organ of Amativeness stimulates the action of the secreting or sperm-preparing organs,

the testicles. The presence of the seminal fluid in the seminal vesicles, re-acts upon the brain, and the mind glows with voluptuous ideas. Under their influence, men are gallant, kind, attentive, and loving to women; ever seeking their favours; ever pressing their suit. It is the part of woman to accept or repulse; to grant or refuse. It is her right to reign a passional queen; to say, "thus far shalt thou come, and no farther." It is for her nature to decide both as to whom she will admit to her embraces, and when; and there is no despotism upon this earth like that which compels a woman to the embraces of a man she does not love; or to receive the embraces of a man she does love when her nature does not require them, and when she cannot partake in the sexual embrace without injury to herself and danger to her offspring. If a woman has any right in this world, it is the right to herself; and if there is anything in this world she has a right to decide, it is who shall be the father of her children. She has an equal right to decide whether she will have children, and to choose the time for having them.

This is a law of nature, respected throughout the animal kingdom. The female everywhere refuses sexual union with the male, except at the appointed season; and compulsion at any time, and especially during pregnancy, cannot be called beastly, for this would be a libel on the brutes.

The expressions of love antecedent to, and connected with its ultimation, are varied and beautiful, involving the whole being. Love gives light, and a trembling suffusion to the eye, a soft, tremulous tenderness to the voice, a sweet sadness to the demeanour, or a deep joyousness; a certain warmth and voluptuousness preside over the movements of the body; blushes come often to the cheeks, and the eyes are cast down with consciousness; the heart swells, and beats tumultuously; there is a radiant idealisation of

the beloved object, who seems to enamoured eyes clothed with every perfection; an exquisite delight pervades the sense of feeling; every touch, even of the garments, gives pleasure to those who love; hands are clasped with a thrill of delight; lips meet in rapturous kisses; and the same instinctive attraction, which brings together the two sexes of the lower animals, acts not less powerfully in man; but should act always under the influence of tender sentiment, refined feeling, reason and conscience, for the greatest good as well as the highest happiness. This sexual congress, should, for the protection of all concerned, have the sanction of needful social regulations.

There are a few practical observations, which may be properly made here, connected with the physiology of the sexual congress. The organs of generation, in both sexes, are excited and stimulated by idleness, luxury, and every form of voluptuousness. Where it is desirable to avoid such excitement, all these must be guarded against. Passionate poetry and romances, warm pictures, dancing, especially the dancing of the stage, the fashionable display of female arms and bosoms, all fond toyings, and personal freedoms between the sexes, must be avoided by those with whom chastity is a necessity of age or circumstance. The lips are supplied with nerves of sensation from the cerebellum; and the kisses of the lips are sacred to love. The bosom is also supplied with nerves from the same source, and it is in the most direct and intimate sympathy with the female generative organs. A woman of sensibility, who would preserve her chastity, must guard her bosom well.

But the best safeguard against one passion, is to arouse another, and, if possible, many others. Friendship is often a safeguard against love; even the friendship of young persons of opposite sexes. In the family, in

schools, and in society, the more a friendly familiarity exists, the less likelihood is there of amative excitement and indulgence. Friendship comes so near to love, in its character, that it often takes its place, and is sometimes mistaken for it. Business, study, active exercises, amusement, ambition, reverence, a constant occupation of mind and body, divert the vital forces into so many channels, that the system feels no pressing wants in this direction, and men live in the bustle of active life, for months and even years, without amative wants.

Women govern themselves much more easily than men. With great numbers, continence is no virtue, for they have not the least attraction for sexual connection, nor are they capable of sexual enjoyment. This is, indeed, a diseased condition, hereditary or acquired; but it is common to an incredible degree. But even with women of passionate natures, who are capable of the most ardent love, and the fullest enjoyment, certain conditions are necessary to the awakening of sexual desire. They must love, and be beloved. Love must begin in the soul as a sentiment, come down into the heart as a passion, before it can descend into the body as a desire. Such a woman will be continent without the least difficulty, so long as she does not love; but when she loves a man, she gives herself to him, soul and body. Happy the man who can inspire and respond to such a love! Happy the child born of such a union! Happy the human race when there shall be no others!

CHAPTER VIII.

IMPREGNATION.

THE formation of the zoosperm, or seminal animalcule, in man, and the ovum in woman, belongs to the domain of organic life, yet all the highest powers of the soul, and the soul's organs, are engaged in the work. For there is to be more than a mere bodily organisation formed—a mass of bone, muscle, and various tissues. First of all, there is to be generated an immortal soul.

The soul of man, like his body, is the creation of Infinite Wisdom and Power, but God works by means and in accordance with fixed laws; and as bodies are so formed as to generate other bodies, so it may be that souls, in like manner, generate souls. This may be the mode chosen by the Creator; so that the parents of every child are the parents of its immortal part, as well as its mortal. If souls were made apart, and then came into bodies formed for them, how could they be affected with what theologians call original sin—the evident depravity which exists in man, and so widely distinguishes him from all other creatures?

It is, in fact, the soul, so generated, if we accept the hypothesis to which analogy points, which forms the body which, for some years, is to be its habitation, the medium of its perceptions, and the instrument of its expression. The generation of souls seems necessary, indeed, to explain the facts of the hereditary transmission of moral and mental, as well as physical qualities. The souls of children—their moral characters—are like those of their parents, and compounded of those of their fathers and mothers, some more

resembling one, some the other. We never find the soul of a European in the body of a Hottentot, or the soul of a North American Indian in the body of a native of China.

All varieties of human character are expressed in differences of organisation. The physiologist reads them in temperament and general conformation; the physiognomist sees them written in the lines of the face; the phrenologist in the developments of the brain; but all these are effects, not causes. It is not the body that shapes the soul, but the soul that forms the body. It is the brain that gives shape to the skull, and not the skull that circumscribes the brain's development. It is the faculty that shapes the organ, and not the organ that hampers the faculty. The soul forms the cortical substance of the brain, and from this the whole nervous system; and it is the nervous system, acting upon the blood, that builds up the whole body, and not, by any means, the reverse of this.

Two human beings, uniting as one, becoming "one flesh," have thus given to them the power, or are the appointed instruments, of generating a third being—body, soul, and spirit. They form it according to their own capacities. Or, if the soul have any other origin it must be admitted that they limit its expression and development, and all its earthly manifestation; so that there are great and little souls, beautiful and ugly souls; and so on of all varieties of human character.

But it must also be admitted that there are facts of human intelligence and goodness not easily accounted for upon the theory of hereditary transmission. How came a Shakespeare to spring up in Warwickshire? What do we know of the progenitors of our greatest geniuses in every department of human achievement? We must admit of other influences — of supernal inspirations.

It may be that if we could know the conditions and peculiar relations and elevations of the souls of parents in the generation of souls of genius, we might see a solution of the mystery. But leaving out such apparently exceptional facts, we can see that, as a general rule, in families, nations, and races, the children resemble their parents. English, Scottish, Welsh, Irish, have peculiarities as marked as Chinese, Negroes, North American Indians, and Esquimaux.

And the soul grows like as the body grows, and changes as the body changes, and grows strong by exercise, and great by the reception of soul nutriment; and is prepared to generate still higher souls: and this is the law of education, development, progress. So we have diseases of the soul as of the body; these re-acting on each other; and each susceptible of proper curative treatment. Does not the mind feed on thoughts and feelings, and get starved or surfeited, and grow dyspeptic on trash or sweetmeats, or exhilarated and intoxicated? Who has not felt his whole soul strengthened by communion with some strong spirit?

This sublime function of the generation of human beings, soul and body, is performed by the two male and female organs, the testes and the ovaries, acted upon by every human faculty, and modified by every human circumstance and action.

It is not in my power to solve the questions respecting the portions of the mental and physical organisation, contributed by either parent. I see no reason to believe in any such partition. I think each has a share in the formation of every part, though in any part the influence of one or the other may preponderate. A child may resemble either of its parents, or both, or it may be more like one of its grandparents than either. It may have more of the mind of one, or the physical constitution of the other, or both may

be evenly mingled. If a man have a powerfully-developed and active mind, and a woman a vigorous organic system, it is likely that their child will resemble each in their strongest points. Germ cell and sperm cell, I believe, are both engaged in the formation of every faculty and organ.

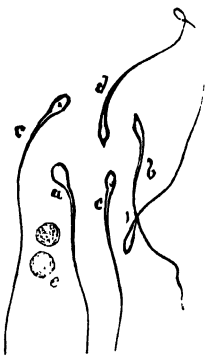

Fig. 31. — Human Spermatozoa, magnified 900 to 1000 diameters. The round bodies are cells in which zoosperms are found.

The sperm cell is the result of the action of that complex organ, the testicle—an organ composed of a vast surface of tubular structure, and amply supplied with nerve and blood, by which, and out of which, these animate cells are formed. Then, within the primitive sperm cell, appear cells, and within these are formed, first in a circular mass, a great number of exceedingly minute living beings, consisting of an oval-shaped body, and a long tail. This self-propelling cell swims in a fluid substance, like the white of an egg, but more opaque, formed partly in the testes, and partly secreted by the prostate gland. In full health and vigour, these zoosperms are very numerous and active; in sickness or exhaustion they are few and weak, and in certain states of the system they entirely disappear, and the power of fecundation no longer exists. The primitive germ cell first bursts, setting free the smaller cells, and

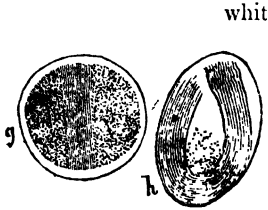

Fig. 32.—Evolution of Spermatozoa.

these, in turn, liquefy, and set free the now perfected zoosperms; the seminal fluid containing them then passes on through the vasa deferentia, up the spermatic cord, passes through the walls of the abdomen, and is received, with the prostatic fluid, according to the common belief, into the seminal vesicles, which are a reservoir in which it is retained, until expelled by the action of the proper muscular apparatus in the sexual orgasm.

The zoosperms retain their power of motion, under favourable circumstances, for hours, and even days, after being ejected. In fish, which do not copulate, they swim about in the water, until they come in contact with the eggs spawned by the female. The ripe eggs, or hard roe, may be taken from the body of a female fish, and the testicle, or soft roe, from the male, and fecundation produced by mingling them together, and ponds and rivers may be stocked with fish, by this mode of artificial impregnation.

In the generation of mammalia, by the entrance of the penis into the vagina, the spermatic fluid should be thrown into the mouth of the uterus, and then, by the contractions of that organ, forced up the fallopian tubes, toward the ovaries. But several circumstances may prevent this being accomplished. The male organ may be too short to reach the uterus; it may not, from some malformation, be even able to effect an entrance into the vagina, and still impregnation may take place; for the active zoosperms, in great numbers, move every way with a rapid motion, and are able to find their way through the entire length of vagina, uterus, and fallopian tubes. On the other hand, when the womb is too low, in the common ailment of falling of the womb, the semen may pass beyond the mouth of the womb, and be lodged in a deep fold of the vagina, which may prevent impregnation.

While the testicles are engaged in the evolution of zoosperms, the ovaries of the female are no less active in forming and ripening the ova; but with this striking difference, that, while zoosperms are formed by millions, and may be ejected day after day, we have but one or two, or in rare cases, from three to five, ova perfected once a month; and this process ceases during gestation, and should also be suspended during lactation. The ovum, or egg, which, in all its essential parts, is alike in all animals, and which consists of a cell, a nucleus, and a nucleolus, is found in the stroma or mass of the ovary. The egg of the common fowl may be taken as the type of all eggs. Its yolk and white are of immense bulk, compared with its germinal spot, because there must be contained within the shell the entire matter of which the perfect chicken is formed. In the human ovum this matter is small in quantity, as the fœtus, from an early period, is nourished by the blood of the mother in the uterus.

When this egg is fully formed, ripened, or matured, the cell which envelopes it swells, bursts, and sets it free. It is then grasped by the fimbriated extremity of the fallopian tube, and begins its journey down that passage to the uterus. It may be impregnated at any time after it is set free by the bursting of the graafian vesicle, until its arrival in the uterus, and possibly until its expulsion from that receptacle.

It will be seen that conception can only take place under certain well-defined circumstances. First, there must be a ripened ovum, set free from its graafian vesicle. This takes place regularly once a month, after the period of puberty, and in all healthy females is marked by the menstrual evacuation. If this evacuation is coincident with the expulsion of the ovum from the ovary, impregnation must take place, if at all, within eight, or, at most, twelve days of that period. The zoosperms may meet the ovum on its passage, or,

possibly, the ovum may find the zoosperm awaiting its arrival. It follows that sexual connection, to answer its natural end, should take place not more than three days before the beginning, or within ten days after the menstrual evacuation.

But in the diseases and irregularities of our lives, with the excitements of stimulating food and general false habits, with the continual over-excitement and exercise of the generative organs, these processes become irregular, and their normal signs not to be depended on. Ova may be prematurely ripened by excitement of the ovaries, caused by sexual indulgence. The menstrual evacuation, which degenerates into a real hemorrhage, becomes irregular and uncertain, as well as depraved in its character. Consequently, the rule that sexual union, to produce impregnation, must take place either immediately before, or a few days after, menstruation, admits of exceptions. It is a safe rule for those who desire to procreate; but not entirely safe for those who would avoid it, as many, for good reasons, may.

Menstruation appears to be a throwing off of the fluids concerned in the ripening and expulsion of the ova. In a perfectly healthy state, the menstrual fluid is very small in quantity, and scarcely tinged with the red colouring matter of the blood. In disease, it becomes a genuine hemorrhage, lasts for three or four days, or longer, with the loss of several ounces of blood, mingled with the proper menstrual fluid. There is no better test of the health of a woman than the one I have just given.

In what manner the actual impregnation of the ovum takes place, we have no positive knowledge. Microscopic observers assert that they have seen the zoosperm enter the ovum by an opening left for that purpose. It has even been fancied, that the body and tail of the seminal animalcule form the rudiments

of the brain and spinal cord! Observations of the progress of fœtal development warrant no such conclusion. If it could be established, it would prove that the animal system of nerves was formed by the male parent, and the organic by the female. The resemblance of children to their parents, and all the phenomena of hereditary transmission of qualities, prove that both parents are concerned in the production of every part.

We have, then, two objects here of microscopic minuteness. One is the germinal point in the female ovum; the other is the zoosperm, or some portion of it. In each of these minute organisations is comprised the elements of a glorious and immortal being. Each contains, moreover, the rudiments of the very form and qualities of that being, physical, moral, and intellectual. There, in that point of matter, that pellucid cell, we have the shape and air, the talents and genius, the honesty or roguery, the pride or humility, the benevolence or selfishness of the future man. We have what determines the form of his head and hands, the contour of his nose and chin, the colour of his eyes and hair. Moreover, this spermatic animalcule, or this cell germ, has all hereditary idiosyncrasies and diseases, gout, scrofula, venereal taint, or insanity.

We can scarcely conceive of this, yet we must admit it. All the grand and energetic qualities that made a Cæsar or a Napoleon—all that can be fairly attributed to blood and birth, to hereditary influences, must have been contained in one or both these atoms.

I do not underrate the influences that may act upon the fœtus during gestation. I give full credit to the power of education in forming the human character; but I assert that all which makes the basis of the character, mental and physical, must reside in the germ and the spermatozoon, and must combine at the moment of impregnation, or the union of these principles.

For all the qualities of soul and body which make the differences between a mouse, a dog, a horse, an elephant, must be in their germinal principles. The appearance of the zoosperms in different animals varies slightly under the microscope—that of the ova scarcely at all. Moreover, when two nearly allied species of animals engender; when, for example, the zoosperm of the ass unites with the ovum of the mare, each parent is found to contribute to the mental and physical qualities of the offspring. In all crossings of different breeds of animals, we find the same effects produced, the more powerful impressing themselves most strongly, and the two sexes giving each certain peculiar characteristics.

Nor is this by any means less notably the fact in the human species. When sexual commerce takes place between a negro and a white woman, the child partakes of the mental and physical qualities of both.

If we do not understand the process by which the union of the male and female elements is accomplished, in the generation of the new being, the conditions under which it must take place are more clear to us. From a multitude of observations, it appears,—

1. That the ovum, in a state of healthy maturity, must have been set free from the ovary. This is not the case with some of the lower animals. There are insects, in whom a single act of the male will fecundate successive generations. In birds, the male principle seems to be added before the egg is mature.

2. The sperma must be recent, and must contain living, active zoosperms.

3. The smallest quantity, and probably a single zoosperm, is sufficient, if it comes in contact with the ovum.

4. It is not necessary that there should be any enjoyment of coition, on the part of the female. Women

who have none, seem even more prolific than others. It may take place in sleep, or other insensibility. In men, also, the orgasm may be accompanied with no pleasure, and even with pain.

5. Even the sexual union is not indispensable. There is no doubt that a female ovum may be impregnated by semen conveyed to it artificially; and a woman, if she chose, might have a child without ever coming into personal contact with a man. This has been shown in animals by abundant experiments, and is said to have occurred in human subjects. There is, however, not the slightest reason to doubt the result, if the experiment were fairly tried.

There are a few other points of interest, which may as well be discussed here as elsewhere. Few questions are of more practical importance to the human race than under what circumstances the generative act should be performed. I will give my opinion briefly, stating the reasons where they are not self-evident or apparent.

1. The generative act should be performed by two persons arrived at a full development of their powers, physical and intellectual. The children of young and immature parents are apt to be weak and scrofulous. Age cannot be given as an absolute index of maturity, and there are some who are never mature.

2. It should be performed with all the attraction and charm of a mutual love; and the existence of this is the best evidence that the parties are suitably related to each other; for those similarities of constitution, which forbid the marriage of near relations, and which often exist without consanguinity, and are sometimes wanting with it, also prevent a true love. Hence, marriages of family interest, convenience, similarity of tastes, and friendship, may be very unfortunate with respect to children. Love, and its functions, require a mingling of opposite qualities.

No man ought ever to beget a child for a woman he does not love; and, especially, no woman ought ever to submit to the sexual embrace of a man, unless assured that the union is sanctioned by a mutual affection.

3. It should not be performed, by man or woman, so as to entail hereditary disease upon their offspring. Insanity, scrofula, consumption, syphilis, diseased amativeness, deformities of body, or distressing singularities of mind, should not be entailed upon posterity.

4. A woman should avoid conception, if her pelvis is so small, or so deformed, as to hazard her own life in delivery, or destroy that of the child, or compel an abortion.

5. In the present social state, men and women should refrain from having children, unless they see a reasonable prospect of giving them suitable nurture and education. We have no right to inflict an injury upon an individual or society.

But how is pregnancy to be prevented? There is one way that is natural, simple, and effectual. It is to refrain from the sexual act. It is easily done by most women, and by many men. In every civilised community, thousands live in celibacy, many from necessity, many from choice. In England and the older American States, there is a large surplus female population. In catholic countries the whole priesthood, and great numbers of religious, of both sexes, take vows of perpetual chastity. This practice has existed for at least sixteen centuries.

I have shown that, in ordinary cases, conception can only take place when connection is had a day or two before, or ten, or, for safety's sake, say sixteen days after menstruation. There is, then, a fortnight each month, when the female is not liable to impregnation; but it must be remembered, that if she is amatively excited in this interval, the ripening of

the ova may be hastened, and the very result precipitated that it is intended to avoid. And it is also to be observed, that the natural period for sexual union is when it is demanded for the purpose of procreation, and that the use of marriage, or the sexual act, for mere pleasure, and using any means to avoid impregnation, are unnatural. It is questionable, therefore, whether we can morally justify the use of any means to prevent conception. If it can ever be justified, it is when a woman is unwillingly compelled to submit to the embraces of her husband, while her health or other conditions forbid her to have children.

The limitation of the number of children is advocated as a right and a duty by a class of social reformers, who, at the same time, insist upon the right and even duty of frequent gratification of the amative propensities by all persons who have arrived at the age of puberty. Virtue, chastity, continence, they denounce as unnatural and mischievous. I hold, on the contrary, that the law of a pure and unperverted nature, is the law of chastity, and that it is consistent with the highest health, and the best bodily, mental, and moral condition of men and women; and that men and women can and ought to be as natural and moral, at least, as the lower orders of the animal creation.

The secularist philanthropists who teach in several languages and many editions of their favourite book, that it is not only the right, but the duty, of all persons, married or single, from the age of puberty, to have frequent and regular exercise of amativeness; who hold that what good men in all ages have called virtue is a vice, that chastity is wickedness and continence criminality, and that lewdness, fornication, and adultery are moral duties, are obliged also to advocate the use of preventive checks to an increase of population. Openly advocating universal prostitution, concubinage, and promiscuity, with its

unavoidable incests and demoralization; seeking for sensual pleasure rather than the true purposes of the sexual relation; wishing to enjoy a selfish gratification and to avoid the burthens and responsibilities which naturally belong to it, they teach that it is the right and duty of men and women to prevent pregnancy.

Every mode of prevention, other than that of living in chastity, is an evident violation of nature, and can only be resorted to as a choice between unavoidable evils. Pressure upon the urethra causes disease; withdrawal is little better than masturbation—the sin of Onan. The very thought and intention of enjoying a natural pleasure and at the same time doing something to hinder the natural effect of such enjoyment, is a source of evil. The soul participates in the act and the enjoyment; but when pleasure is divorced from the natural motive and use, it becomes a mere sensual gratification, against which conscience protests and even instinct revolts. Our only safety, and our highest good, in this as in all things, is in finding what is true, natural, and therefore in accordance with the law of life written in our moral and physical constitution. This is the path of health, purity, and happiness.

CHAPTER IX.

MORALS OF THE SEXUAL RELATION.

HERE, as well as anywhere, I may say what may usefully be said on sexual morality, and of what it seems well for every one to know of what we may call the ethics of the sexual relation.

From birth to puberty, or the period when the sexual organs assume their natural functions, which

is at the age of about seventeen in males and fifteen in females, with variations of a year or two, over and under,—during the period of infancy and adolescence, there should be no excitement, no irritation, no action of any kind in the amative system; but perfect purity in thought, and word, and deed.

It would be well if children had no sensation and no idea of sex. Unfortunately, the exciting and diseasing habits of civilisation tend to produce an unhealthy precocity in the young of both sexes. Children either fall into habits of solitary vice—from hereditary predisposition, or a stimulating diet,—or they are taught libidinous and destructive practices by ignorant or unprincipled servants, or companions or schoolfellows who have been in some way corrupted.

If they could be kept in ignorance and innocence, it might be best—but the risk of trying to do so is so great, that it seems to me better that every child should be taught, as early as it has the power to sin and the liability to suffer, what is the sin against nature it has to avoid. It is a terrible thing that the whole life of a beautiful boy or girl should be wrecked, because, in pure ignorance, he or she falls into a bad habit spontaneously, or is taught it by another. Surely it would be better if every child were clearly told and solemnly warned of its danger. Of the practice of masturbation, and its terrible consequences, more will be found in the chapters on disease.

With the period of puberty, sometimes before, comes the season of sentimental love. And this love should be kept entirely free from the physical or reproductive element. Pure love is chastening and refining in its influence. It is imaginative, poetical, tender, romantic, heroic; and the longer this period lasts the better. As marriage should not take place until the bodily powers are considerably matured, there should not be in early

love any desire or even thought of sexual union. The law of the purest and highest life is perfect purity, complete chastity, entire continence, before marriage. Society rigorously insists upon this with respect to women. Every man wishes his bride to come to his arms a virgin; but the law of nature is the same for both sexes. All women have an equal right to marry —all should come purely to the marriage bed. If young men are to have a license denied to young women, what are the means? Either adultery, which is such a crime that men justify the husband who kills both wife and paramour; or the seduction, ruin, and prostitution of unmarried women.

What is right for one sex must be right for both; what is wrong for one must be wrong for both. There can be no right of men to destroy a certain number of women, making them the victims of their lusts, in order that those they marry may be virtuous. We must either stand upon the Christian rule of sexual morality, or admit of universal license. We must have chaste youth and virtuous manhood and womanhood, or see our social world become one vast brothel of unbridled lust.

The law of married life is one of temperance or moderation—a natural use of marriage for its chief object, the begetting of offspring. The law of the whole animal world is sexual connection for the purpose of reproduction, only at such times and in such quantity as best favours that result. The females of all the animal races, insects, birds, beasts, in this matter govern, and admit the access of males only when they require it for the fecundation of germs and the production of offspring. They sternly refuse at all other times, and we should detest any animal that made pleasure alone the motive of sexual union. There can be no doubt that this is also the natural and healthful law of the human species.

The germs, as we have seen, are ripened and thrown off once a month. This, then, is the natural period of the sexual congress. It should take place when both parties are in full vigour—never in fatigue, never when exhausted by bodily or mental toil, never in sickness; above all, never when intoxicated. Body and mind should be free from all excitement but that of love, from all perturbation but that of a healthy desire. The condition of both parents at this period affects that of their offspring. There should be no excess, no exhaustion. The act should never be more than twice or thrice repeated, awaiting the result; and the congress should not be renewed until the next monthly period. If the menses do not appear, it is a sign that conception has taken place, and the expectant mother must then be sacred from all approach or the least amative excitement through the whole period of pregnancy and nursing. This law is respected by savages, and is regarded over a large part of the civilised world, and should never be violated. No breeder of horses, or cattle, or animals of any kind, would permit intercourse while they were with young—and the human female should assuredly be held as sacred.

A word of advice is needed for the young. The first union—the consummation of marriage—needs great care. The bride a man takes to his heart should be treated with exceeding delicacy. There should be no word or act to shock her modesty. The lover who has become a husband should be sober, discreet, and very careful to do her no injury. He can wait. It is a great happiness to wait, and to ask nothing until she is willing to grant him all. And in the embrace in which all is given, there must still be great care not to hurt, nor to injure a delicate organism. The vagina may be contracted—give it time to expand. The hymen may not readily yield—do not rupture it too rudely. Wait until the pleasure shall overcome the pain. Leave it

in good part to her own effort. And in all this intercourse, if one would preserve its bloom and sweetness, there should be the same tenderness, the same delicacy, the same unselfish regard for the happiness of the other. The best writer on this whole subject of marriage is St. Paul, and his luminous epistles I commend to every reader. In an honest and true love there is no cause and no room for jealously. "Perfect love casteth out fear."

The power of producing germs in the ovaries, which by fecundation develope into offspring, begins in woman with, or in some cases even before, menstruation, and continues to the "turn of life," or the period when it ceases, usually at from forty-five to fifty-five years of age. Men have the power of procreation sometimes to a very advanced age, and some have begotten children when more than a hundred years old. But this power should be used with great care and temperance by the aged; and those who would live long, and keep the energies of their bodies and minds, do well to refrain from it altogether. After fifty, sexual pleasures are very exhausting. They often bring on paralysis or apoplexy. The strongest old men are celebates, or those who live in perfect continence. A woman who wishes to guard the health and life of her husband, must induce him to entirely refrain from amative indulgence.

Great numbers of women can easily refrain, for they have no desire, and no enjoyment. Either they are born so, or have lost the power of pleasure by early abuse or excess, or by frequent child-birth, or abortions and miscarriages. In some way, they do not possess, or they lose all sensibility. But with many women, also, it is voluntary. While they submit to the demands of their husbands, they can withhold any participation. They may become pregnant, all the same. Many women have families of children without

the least enjoyment of the sexual embrace. Women are sometimes deeply injured in their nervous systems by the efforts of their husbands to make them participate in, and so heighten, their enjoyments.

Certain kinds of food and drinks stimulate the amative propensity and its organism. "Oysters and eggs are amatory food," which is also true of game, fish, and of animal food generally; whose effect is much increased by salt, pepper, and spices. Coffee and chocolate and all rich wines have the same effect. Strong coffee is one of the most active of amatory stimulants. Alcohol does not so much stimulate lust, as dull the sense of caution, and the scruples that restrain men and women from enjoyment. The woman who drinks with her lover, is in his power.

There are drugs which quiet the amative feeling. This sedative influence is attributed to tobacco; and *satyriasis* in men, and *furor uterinus* in women—manias of unbridled lust—are treated with doses of the carbonates of sodium and potassium. A full diet provokes to lust; so does idleness of mind or body. The vital force must act in some direction; and if we would not have it expended on alimentiveness and amativeness, we must direct it to other and nobler uses. Perfect temperance, and even abstinence, or a pure, bland, simple, and very spare diet—bread, fruit, and cooling vegetables for food, and water for drink, with the love and desire of purity, and a varied activity of body and mind, are the best remedies. He who bathes daily, takes much active exercise, abstains from stimulants, lives on simple fare, does not eat after four o'clock, and sleeps on a hard bed with a light covering, will have little trouble from a disordered amativeness.

It is evident to every observer of human nature that the influence of sex runs through the whole mental and moral character. Men differ from women as much in brain as in body. They have certain organs

relatively larger, and others relatively smaller, than women. The moral organs correspond intimately with all physical differences.

If we could compare the most masculine woman with the most feminine man, there would still be a wide difference. But this wide difference does not prove that woman was intended to be the slave, the tool, and the victim of man, as she is and has been. In making her such, man wrongs his own nature as much as he wrongs hers, and he wrongs the whole human race. If man would follow his own pure instincts, woman would have nothing to complain of and nothing to desire. By the rights of her love, by the power of her beauty, by the strength and tenderness of her passional nature, she would be acknowledged as the queen of the social universe; while man would reign in the sphere of intellect and material achievement.

It cannot be necessary in a Christian country to speak of those unnatural sexual crimes which shock society, and are sometimes punished by the laws. The sin of Sodom is found to some extent in the army, the navy, and in prisons, and is not unknown in the Metropolis. We read in the papers brief mention of prosecutions for other unnatural crimes. Incest, alas, is so common among the crowded populations of the very ignorant and very poor, that it is seldom punished. The marriages of near relations are also far too frequent; for there can be no doubt of their bad effect upon the bodily and mental organisation of their offspring. In a true society there would be no marriages of interest or consanguinity. The law of love is like that of magnetism—the attraction of opposites.

CHAPTER X.

EVOLUTION OF THE FŒTUS.

THE ovum once impregnated, Nature, by which I mean the informing soul that presides over the whole organic system, and gives intelligent guidance to every part, carries forward its development, as nearly as can be observed, in the following order:

The ovum is, from the first, enveloped in two membranes, the outer of which is called the chorion, the inner the amnion. Within lies the principle of life, the germ of the complex being. The ova of all the higher animals are alike at this period, and one cannot be distinguished from another. The amnion, or inner membrane, secretes upon its inner surface the liquid in which the fœtus is suspended during the whole period of gestation. The chorion, or outer covering, on the other hand, acts outwardly, throwing out villi, which, gathered at one point, at a certain period unite with vessels on the inner surface of the uterus, and form the placenta, or afterbirth, by which the fœtus is nourished from the blood of the mother.

The central germinal point of the egg, and its two coverings, form the three parts of a regular cell formation—cell, nucleus, and nucleolus.

While the ovum is gradually passing down the fallopian tube, propelled by the action of its ciliary bodies, a journey which lasts from eight to fourteen days, and in the course of which it is liable to impregnation, the uterus is preparing for its reception. A delicate secretion is poured out over its whole internal surface, which is organised into a membrane called the decidua, so that when the ovum arrives at the lower end of its fallopian tube, or one of the horns of the uterus,

this decidua bars its entrance. But as the ovum is pushed forward, the membrane gives way, and is folded around the ovum, so as to make a double covering. The outer portion is called the decidua vera, or true membrane; the inner, the decidua reflexa, or folded membrane.

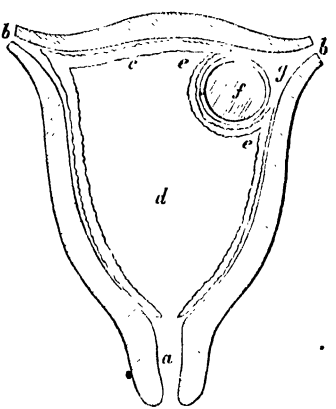

Fig. 33.—Ovum Entering the Uterus.*

We have the ovum now protected by no less than four membranes—two proper to itself, the amnion and chorion, and the two formed by the folded decidua of the uterus.

During its passage down the fallopian tube, the entire ovum is so small that it is with great difficulty it can be found by the closest inspection and the aid of a powerful microscope. When found, however, and subjected to a high magnifying power, it exhibits the same phenomena as is displayed in the incubation of any other egg. There is the yolk, the germinal spot, which gradually expands, and the formation, first of blood, and an external circulation,

* Plan of the uterus at the moment when the ovum, *f*, surrounded by its chorion, *g*, is entering its cavity, and pushing the decidua vera before it to form the decidua reflexa. *a*. Neck of the uterus. *b*, *b*. Entrance to the fallopian tubes. *c*, Decidua vera, covering the walls of the uterus at every point. *d*, Cavity of the uterus.

and then of the rudimental organs; but these latter changes take place in the uterus.

From my more recent work, "HUMAN PHYSIOLOGY the Basis of Sanitary and Social Science," Part IV., Laws of Generation, I copy the following passage and illustrations :—

"The human ovum, at its impregnation, is very small—smaller than the naked eye can distinguish. It is from the 1-120th to the 1-140th of an inch in diameter. But from the moment of fecundation it grows with great energy. In a fortnight it is of the size represented in Fig. 34. The fœtus of one month is an inch long; two months, two inches and a half long; three months, five inches; five months, six or seven inches; seven months, eleven inches; eight months, fourteen inches; nine months, eighteen inches.

Fig. 34. Human Ovum laid open.

"The interior structure of the ovum, and the gradual development of the germ, embryo, and fœtus, are best explained and illustrated by reference to the larger eggs of fishes and birds. The hen's egg may be taken as a model, and when a hen is setting, or, more humanely, when eggs are being hatched by artificial heat, if one be broken every second or third day, the whole development may be watched with great facility.

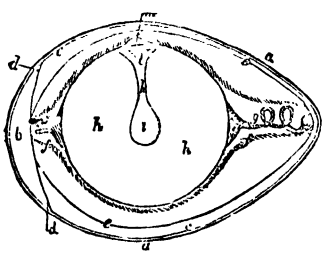

Fig. 35.—Ideal Section of a Hen's Egg.*

* The egg of the fowl is the type of all ova, and from its large size is easy to study. *a, a.* Shell. *b.* Space filled with air to supply oxygen. *c.* Membrane of the shell, which, at *d, d,* splits

Nature, it will be seen, has prepared everything, forgotten nothing, and goes on in the formation of a new being, insect, bird, or man, with the same wisdom and power that creates a universe.

"The first step in development in the yolk of the egg must be the vitalisation of its matter—further vitalisation, I should say, for it is already alive—an organised existence. But the entrance of the masculine element

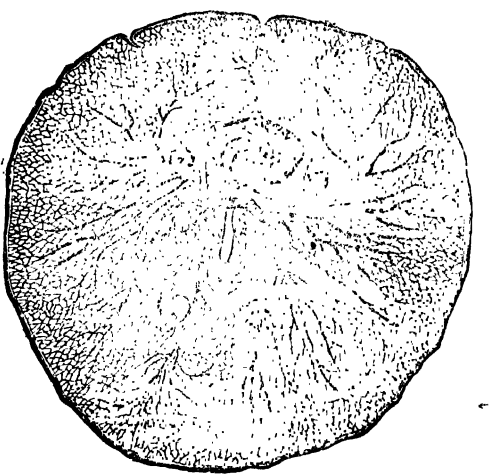

Fig. 36.—Chicken's Egg, Third Day of Incubation.

into two layers. *e, e.* Limits of the second and thicker albumen. *f.* Limits of the third and thickest albumen, the white being in three layers. *g, g.* Chalazæ, or ropes of twisted fibres from the yolk, which hold it in its place. *h.* Yolk. *i.* Central cavity in the yolk, from which a duct, *k*, leads to the cicatricula, or tread. *l.* Cumulus proligerous, or germinal cumulus. *m.* Germ, or blastos. The egg is so formed that the yolk floats high in the white, and the germ is always uppermost.

—or its union with the feminine element, whatever they may be—gives a new and very intense life. There is a diffusion, perhaps a rapid spreading growth of fibres of the nerves of organic life. Under their influence cells are formed of matter already fitted for such structures. These cells undergo rapid transformations, and become the blood, muscle, bone, all the tissues of the young animal. In the egg, these cells are seen to become more opaque in some parts, more transparent in others; they divide and subdivide, until the yolk forms what is called a mulberry mass. A germ gathers upon the surface, and separates into three layers. In the eggs of fishes, which are so transparent as to be easily watched through the process of development, may be seen an upper or nervous layer, in which are formed the organs of animal life—bones, muscles, brain and nerves, etc. The lower layer gives origin to the organs of vegetative life—the abdominal viscera, intestines, or alimentary system; the intermediate layer produces the heart, arteries, veins, etc., of the system of circulation.

"At a very early period, the general form of the insect or animal is manifested. In insects and crustaceans, the germ is divided into sections. In the germs of vertebrate animals, there is seen the rudiments of a spinal canal, which, when formed, is filled with a fluid, from which is formed the brain and spinal cord. The embryo rests upon the yolk, and covers it like a cap, vertebrates enclosing it by the edges uniting at the navel.

"In fishes, whose embryonic development has been carefully observed by Professor Agassiz, the first lines of the embryo appear on the tenth day—a canal, which becomes a tube—the spine, and an enlargement at one end, the rudimentary head, in which may soon be seen a division of the brain for the organs of sight, hearing, and smell; and soon after the rudiments of

eye and ear are apparent. About the seventeenth day the heart is seen as a simple cavity, and, as soon as it is closed, there are regular contractions and a movement of blood corpuscles. On the thirtieth day there is a regular circulation of blood; the tail gets free, and moves in violent jerks, and the head is soon liberated. The fish has a brain, an intestine, a pulsating heart, and a limited amount of spontaneous motion; but its form is not clearly defined. By the fortieth day, the shape of the fish is evident, the remains of the yolk hang in a bag to its belly, but it soon becomes absorbed, and then the fish is obliged to seek its own food, having exhausted its embryonic provision.

"The condition of the fish about the thirtieth day is shown in the embryo of the fowl as early as the eighth day — Fig. 37, where the head forms more than half the animal, and the eye is out of all proportion to the head. The yolk is being absorbed through a membrane and vessels, which unite to form the umbilicus, the yolk of the egg being to the embryo-chicken what the placenta and blood of the mother are to the human fœtus."

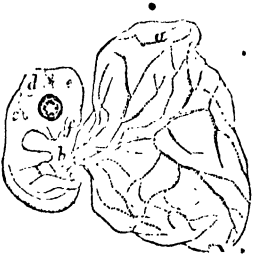

Fig. 37.—Embryo Fowl of Eight Days.*

In the uterus, the growth of the new being is rapid. Still, in the human subject, up to the seventh day, nothing is visible to the naked eye. On the tenth

* A further advanced embryo, with an apparatus of nutrition, called the allantois, *a*, with the umbilical vessels, *b*, branching over it. *c*. The external ear. *d*. Cerebellum. *f*. Hemispheres. The eye is very large, and far advanced; the mouth begins to take the shape of a bill, and the legs and wings are sprouting.

day, there may be perceived a semi-transparent, grayish flake. On the twelfth there is a vesicle, nearly of the size of a pea, filled with fluid, in the middle of which swims an opaque spot, presenting the first appearance of an embryo, which may be clearly seen as an oblong or curved body, according as it is viewed, and plainly visible to the naked eye on the fourteenth day. The entire weight of the embryo and its two investing membranes, waters, etc., is now about one grain.

Fig. 38.— Mammal Ovum.*

The increase from the first is astonishingly rapid, when we consider its original minuteness. On the twenty-first day the embryo resembles an ant, or a lettuce-seed; its length is four or five lines, and it weighs three or four grains. Many of its parts now begin to show themselves, especially the cartilaginous beginnings of the bones of the spinal column, the heart, brain, etc.

On the thirteenth day the embryo is as large as a horse-fly, and resembles a worm bent together. There are as yet no limbs, and the head is larger than the rest of the body. When stretched out, the embryo is nearly half an inch long.

In the seventh week bone begins to form in the lower jaw and clavicle. Narrow streaks on each side of the vertebral column show the beginning of the ribs; the heart is perfecting its form; the brain enlarged, and the eye and ear growing more perfect, and the limbs sprouting from the body. The lungs are mere sacs, about one line in length, and the trachea is a delicate thread, but the liver is very large. The

* Fig. 38 gives a view of the ovum of a bitch, twenty-three days from the last access of the male. The chorion has already shot forth little villi, which, however, are wanting at either end of the ovum, and also over the place where the embryo is situated. This engraving represents its object of the natural size.

anus is still imperforate. In the seventh week are formed the renal capsules and kidneys, and the sexual organs are speedily evolved, but the sex of the fœtus

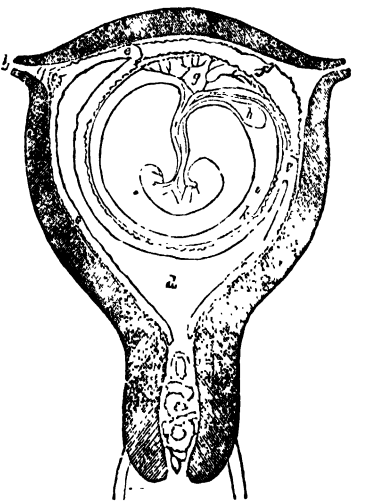

Fig. 39.—Fœtus in Utero.*

is not determined until some time after. The embryo is now nine lines, or three-fourths of an inch, in length.

* Sectional view of the uterus with the ovum; the cervix uteri is plugged up with a gelatinous mass, *a*. The decidua vera, *c*, sends a process, *c2*, into the right fallopian tube; the cavity of the uterus is almost completely occupied by the ovum. *e, e*. Points of reflection of the decidua reflexa. *f*. Decidua serotina. *g*. Allantois. *h*. Umbilical vesicle, with its pedicle in the umbilical cord. *i*. Amnion. *k*. Chorion; between the two, the space for the albumen.

In the eighth week the embryo is an inch long, weighs a drachm, and begins to show the division of fingers and toes.

Fig. 40.
Human Embryo.

At from sixty to seventy days, the development is rapid, and all the parts are in the course of progressive formation. The eyes enlarge, the lids are visible, the nose grows prominent, the mouth enlarges, the external ear is formed, the brain is soft and pulpy, the neck well defined, and the heart fully developed.

At three months, the eyelids are distinct, but shut, the lips are drawn together, the organs of generation very prominent in both sexes, both penis and clitoris being remarkably elongated. The heart beats with force, the larger vessels carry red blood, the fingers and toes are well defined, muscles begin to be developed, and the fœtus is four or five inches in length, and weighs about two and a half ounces.

At four months, it has greatly expanded in all its parts. The abdominal muscles are formed, and the intestines are no longer visible.

At five months, the lungs have increased, and are even susceptible of a slight dilatation. The skin is now in process of formation, the place of the nails is marked, and meconium gathers in the intestines, showing the action of excretory glands. Length, eight or ten inches; weight, fourteen or sixteen ounces.

At six months, a little down appears upon the head, the areolar tissue is abundant, and fat begins to be deposited. Length, nine to twelve inches; weight one pound.

At seven months, every part has increased in volume and perfection; the bony system is nearly complete. Length, twelve to fourteen inches; weight, two and a

half to three pounds. This is reckoned as the epoch of viability, or the period in which the fœtus, if expelled from the uterus, is capable of independent existence.

From this period up to nine months, there is a mere increase of size and action. The red blood circulates in the capillaries, and the skin performs the function of perspiration. Length, eighteen to twenty-two inches; weight, from five to eight pounds.

There are cases in which an ill-nurtured fœtus, at its full period, does not weigh more than two or three pounds; on the other hand, cases are not rare in which the weight is twelve or fifteen pounds.

During the first weeks of the evolution of the embryo in the uterus, it is nourished, as the young chicken is, by the yolk of the egg. But soon the villi of the chorion gather into a compact mass, and become adherent to some portion of the uterus. There is formed thus a placenta, made of two portions, the maternal side, toward the walls of the uterus, and the fœtal, in which the vessels unite into two arteries and one vein, which, with their envelopments, form the umbilical cord, and communicate with the fœtal heart. By this means, at every pulsation of the heart, blood

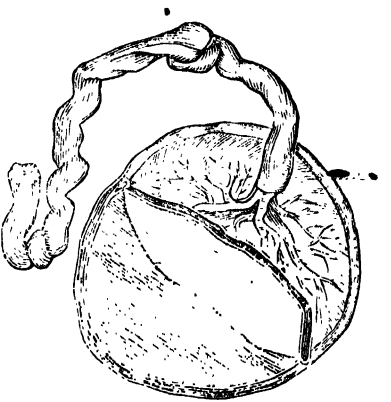

Fig. 41.—The Placenta and Umbilical Cord.

is sent through the two umbilical arteries to the placenta. Here the vessels branch out into capillaries, which mingle with those of the maternal placenta, communicating with the uterus. Through the membranous coats of these vessels, the blood of the fœtus is nourished and purified. It receives nutritious matter and oxygen; it gives out carbonic acid. The placenta answers for the fœtus then, the double purpose of stomach and lungs. The fœtus has its own individual circulation and life; but all its nutriment, from the time this connection is formed, until it is severed at birth, comes from the mother.

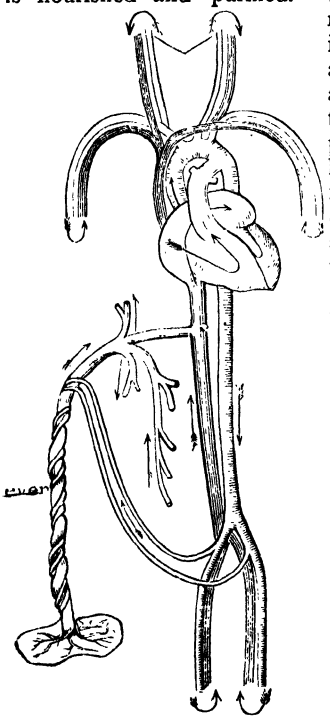

Fig. 42.—Fœtal Circulation.

The regular period of pregnancy in the human female ends with the tenth lunar month, or fortieth week. Physiologists have asked why the process necessary to expulsion should be set up at this period. When they have given an intelligible explanation of any vital periodicity whatever, they may of this. Time is one of the elements of the universe, whether marked

by the beatings of the heart, and the movements of respiration, or the cycles of the stars, which require millions of millions of years for their completion. Regularities of action, and consequent accuracy of periods, are inherent qualities of the intelligent soul, animal or organic. It is the organic soul that presides over the development of the fœtus, and fixes the time for its expulsion. But this intelligent soul is not a machine. It has the power, for good reasons, to bring on the process of labour earlier, or postpone it to a later period.

The normal period of pregnancy is forty weeks, or nine months, reckoning from the last menstrual period. But as some persons have a quicker pulse than others, so, in some, the vital processes may be more rapid. There are also diseased irregularities which vary the time. Even domestic animals vary weeks in their periods. A gestation, even in a tolerably healthy, woman, may be prolonged two or three weeks, and, in disease, still further. On the other hand, it may come on prematurely.

There have been cases where a fœtus of six months has been born, and lived; but seven months is generally considered the period of viability. At this time, even where miscarriages are artificially produced, it is said that two children out of three live. A reasonable man may be satisfied of the legitimacy of his child, if he has not been absent from its mother more than ten months at the period of its birth; and if he can count eight months from his first connection to the birth of a full-grown infant, he has no reason to be dissatisfied. Seven months children are said to occur oftenest in a first pregnancy.

There is no probability, I might say, possibility, that when the uterus is occupied by one fœtus, and all avenues to the ovaries are blocked up, another later conception can take place. But there is no

reason why a woman may not have twins by two fathers, who have connection with her at nearly the same time; and there are several cases in which twins have been born, one white and the other mulatto, or mulatto and black, in which the mother avowed that such a state of facts existed. In the same way, a litter of pups may be sired by several males, each pup bearing a resemblance to its particular father.

CHAPTER XI.

OF PREGNANCY.

I HAVE something to say now of the condition of the mother, and of her relation to her offspring during the interesting period of gestation. And first, how she may know when conception has taken place. A woman has reason to believe herself pregnant when several circumstances combine to render it probable.

1. If she has had sexual connection at the proper period; that is within five days before or ten days after the monthly period.

2. If, after sexual connection, the periodical discharge does not again occur.

3. If she have nausea in the morning, with unaccustomed antipathies or likings for persons and things.

4. If she have sharp pains in her breasts and a dark areola around the nipple, with pimples.

5. If she have a difficulty in restraining her urine.

6. If, after a short time, there is a gradual enlargement of the abdomen, becoming rapid and evident at the third or fourth month.

7. If she feel the motions of the child at and after this period.

Not one of these signs is certain; yet, where they all exist, there is a pretty strong probability. Thus, a woman may have sexual intercourse for years without conception; the menstrual function may cease from numerous derangements of the system; hysteria, or any ovarian irritation, may occasion strange mental peculiarities, antipathies, or longings; pains in the breast and areola may arise from similar causes; there may be irritation of the neck of the bladder, from falling or other displacements of the uterus; the abdomen may enlarge from tumor, dropsy, or even obstructed menstruation; and the motions of a child are often simulated by wind in the bowels and spasmodic affections.

There are signs, however, which are more certain, with a careful professional examination. After the third month it is possible to hear the beating of the fœtal heart, by placing the ear, or a stethescope, upon the mother's abdomen; possible to hear the *souffle* of the blood in the placenta; and to feel the weight of the fœtus upon the point of the finger, properly applied at its lowest part, within the vagina. The first is a certain sound; the second may be confounded with other vascular action; and in the third case a tumor in the uterus may not be distinguishable from a fœtus. An old writer, in speaking of the caution to be used in doubtful cases, says you must never give a decided opinion, until you have the child's head in your hand.

At a certain period of fœtal growth, there occurs a rapid increase, a rising of the uterus in the abdomen, and muscular motion in the fœtus; and this period is called the quickening. There is a notion that the fœtus acquires a vitality or personality at this period, and that it is a greater crime to procure an abortion after than before it. There is not the slightest physiological ground for such an idea. The principle of life is there from the first. The act is essentially the

same, at whatever period it is performed; or, if there is any difference in criminality, it is a gradual increase, according to the period, from the first day to the last.

The ovum belongs to the mother—she alone has a right to decide whether it shall be impregnated. That decision must be based upon her mental and physical condition, her desire for offspring, her ability to take proper care of it, and her social relations. But when a woman has united with a man in the creative act, the life of the being so formed is sacred. From the moment of conception it is a human life with all its possibilities, temporal and eternal.

There may be circumstances which justify the procurement of abortion, or the untimely expulsion of the embryo, or fœtus; such as a degree of deformity that prevents delivery. In such a case no medical man would hesitate to sacrifice the fœtus, to protect the life of the mother. This is as far, perhaps, as his responsibility extends. If a woman destroys her unborn offspring, to save what is more than life to her, and to avoid what is to many worse than death, we may pity her; but her action cannot be justified. It is an act of murder; a crime against nature.

But it is a very common crime among tribes of savages, and in the highest civilisation. In America, and to some extent probably in every country in Europe, there are persons, physicians and others, who make a living—fortunes in some instances—by giving drugs, or performing operations to procure abortions, not only on girls, to save them from disgrace, but upon married women, to relieve them from the inconveniences of childbearing.

There are various modes of procuring abortion; and as this is, in all cases, a violent and unnatural process, it is always attended with a degree of danger, chiefly from a liability to uterine hemorrhage, or flooding.

The most common mode of procuring abortion is by sexual intercourse during pregnancy. Every woman who permits it, does it with this risk. When a woman is weak in constitution, or strongly amative; when a man is violent in his manifestations, or the womb is low, there is always the liability to procure the expulsion of the fœtus. All amative excitement on the part of the female perils the existence, as it injures the proper growth, and injuriously affects the character of the child. The excited uterus expels the embryo, and in thousands of cases this goes on, year after year, and people wonder they have no children. Women who have neither passion nor pleasure are less liable to abortion from this cause than others; but if procuring abortion be a crime, is it less so when done in this mode, and without any proper motive?

Violent exercise of the body, or violent passions of the mind, tend to abortion and miscarriage. Women of weak constitutions should carefully avoid both.

Errors of diet, exhausting labours and cares, bring on abortions and miscarriages. They use up the stock of vitality, or the organic force which should go to the fœtus. It dies, and is expelled. So perish thousands of unborn infants; and as care and poverty increase in our great cities, so increase the number of still-born children.

The use of drugs and the lancet is a prolific cause. Whatever depresses or deranges the vital functions may be a cause of abortion. Blood-letting and drug poisoning do both. There is no doubt that thousands of infant germs are poisoned in the uterus by allopathic medication, while still more are born diseased from the same cause. The doctor poisons the blood of the mother, and from this the blood of the child draws its nourishment.

When abortion is wilfully procured, it is by one of two methods—drug poisoning or a surgical opera-

tion. In the former the mother is poisoned, sometimes fatally, in the effort to expel the child. The surgical method, that of rupturing the membranes, is the simplest method, but not unattended with danger. The most recent plan is to introduce a slender bougie into the uterus and let it remain until it induces contractions.

In a proper social condition, I see no reason why any woman should ever desire to procure an abortion. In the prevalent unnatural conditions of society, and the diseased state of women, morally and physically, it has become a custom of shocking frequency.

The direct physical influence of the father upon the child ceases with the act of impregnation. All after influence must be through the mother, or of an aromal, or what is termed a magnetic character. If the woman, in this interesting period of her life, is folded day and night in the arms of love, and lives in an atmosphere of tender care, she receives strength every hour, and the child may be directly a partaker of the loving father's life. But there is no question of the influence of the mother. If her blood is pure, the child is built up in purity. If she has an abundant vitality, her child drinks from a full fountain. Every thing that disorders the mother affects the child. If ever all the laws of health are strictly obeyed, it should be during gestation.

An impression upon the mother, of any kind, acts upon the child. Children are born happy or miserable, according to the state of their mothers during pregnancy, just as they are born healthy or diseased. Particular talents, tendencies, tastes, idiosyncrasies, and affections of every kind, are impressed upon them, and govern their future lives. The mother of Napoleon, while carrying him, accompanied her husband in a military campaign. The most extraordinary peculiarities are inflicted upon children by some temporary

condition of the mother; and there is abundant proof that this may extend to the body as well as the mind. The facts of this character have been denied by mere theorists, because they cannot account for them. Alas! for what can they account?

Such observations as I have been able to make, induce me to think that the sex of a child is determined by the relative vigour of the parents. The father, from maturity, force of will, or superior strength of the procreative function, may give the masculine development; or the mother, from similar causes, may give the feminine. Where men of mature age cohabit with women much younger, there is an excess of males; but in countries where the customs of polygamy prevail, and a man's vital force is expended on several women, there will be more daughters than sons born to him; so that polygamy perpetuates itself. Where monogamic relations prevail, the sexes are born in nearly equal numbers.

Pregnant women are sometimes affected with the most extraordinary longings, and there is a prevailing impression that they must have what they long for, however absurd or hurtful. A woman has longed for a quart of brandy a day, and drank it. Women eat the most nauseous and indigestible substances. These are states of disease, and should be treated as such. If the article longed for is harmless, as some particular fruit, it should be procured, if possible; but no woman should be allowed to take arsenic because she longs for it, nor anything else that is positively and necessarily hurtful. The pregnant woman should live on the most simple diet, refraining at this time, above all others, from every thing of a mischievous or doubtful nature; bathing regularly, taking exercise, and living in the most exact obedience to the laws of life. Doing this, she will escape hysterical and insane longings, or be able to overcome them, with

great benefit to herself, and without mischief to her child.

All observation shows that not only are the striking characteristics of races transmitted, for thousands of years, as with the negroes, the Chinese, the Jews, etc., but that the qualities and peculiarities of every individual are in like manner transmissible. It is proven also that any faculty exercised during pregnancy by the mother, is strengthened in the child. Thus any mental or moral faculty of the mother may be made striking and active in the child, by being used during pregnancy; and in this way every mother has in her charge, in a great measure, not only the physical, but the mental and moral character of her offspring.

And it is for these reasons that every child should be a child of love, a child of health, and all generous activities; a child of competence, and freedom from care and the miseries of poverty; a child of beauty, begotten and developed amid beautiful things and beautiful thoughts; a child of frank, honest sincerity. If we would improve our race, we must give to the mothers of our race all the conditions of improvement and happiness.

The whole process of gestation, it should be remembered, is a natural process, and every part of it should be naturally performed, from the beautiful act of impregnation, sanctified by the holy passion of love, and accompanied with the most exquisite of all sensual delights, to the grand act of the expulsion of the fœtus, and its entrance upon independent life. And this whole process, when accomplished naturally, is one of delight, and not by any means one of disease and pain. Even the process of childbirth, with such a degree of health and strength as may be gained by the water-cure, and a physiological regimen, is rendered speedy, and almost entirely painless.

The pain of any organic action is caused by dis-

ease. Where there is no disease, there can be no pain. There is no reason why the contractions of the uterus may not be as painless as those of the bladder; and where this organ is in perfect health, they are so. All that a woman wants to secure a painless labour is perfect health; and her labours will be free from pain, and free from danger, just in proportion as she becomes a healthy being.

I have known many cases in which women who have had long, painful, and perilous labours, have by pure diet, exercise, bathing, and other health conditions, come into such a state of vigour as to pass through this trying period with no danger and very little suffering.

During the nine months of pregnancy, in which the happy expectant mother carries the growing babe in her womb, her person should be sacred, her passions calm, her mind serene and full of peace and hope and happiness. No work should weary her, no anxiety disturb her, no lust excite or torment her. She should have daily moderate exercise in the open air, walking or driving; plenty of fresh, pure air by night and by day; daily bathing in cold water, with the frequent use of the sitz bath, the wet bandage, and, if possible, the fountain bath, or rising douche or spray; and also of the vaginal syringe, when there is such need, as will be pointed out in further chapters. Her diet should be moderate, simple, pure, and perfectly healthful; consisting chiefly of brown bread and its equivalents, fruit, milk, vegetables, with little, if any, flesh meat. No heating or exciting condiments, and no tea, coffee, or alcoholic stimulants. Her whole life, in short, should be as natural and therefore as healthful as she can make it. And in her body, and mind, and soul, she should be just what she would wish her unborn child to be in all its future life; for its health and happiness depend in a great measure on the state of the mother during this important period.

CHAPTER XII.

SYMPTOMS OF HEALTH.

MEDICAL books are filled with descriptions, symptoms, and causes of disease. I wish to give a clear description, enumerate the symptoms, and guide my reader to a knowledge of the conditions of health.

Doctors have not been, as a rule, required to keep people in health, but to cure their diseases. It is very seldom that a man sends for a physician and says to him, "We are all, thank God, in pretty good health, and I want you to give us such directions as will keep us so." People wait until they are ill, and then send for the doctor to cure them. Therefore, it is not the interest of doctors to study health, but disease; it is not their interest to preserve the health of the public —their living depends upon the contrary condition. If doctors were paid in proportion to the health of the community, and their incomes were diminished by every epidemic, and every case of disease, we should stand in less need of sanitary legislation.

Physicians are interested in disease, as soldiers are in war and lawyers in quarrels. If we had professional peace-makers between individuals and nations, and professional health-makers, well paid for their successful efforts—paid and honoured in proportion to their success—it might be different. As it is, it is not for the interest of any physician that health should prevail in communities, that any individual should remain free from sickness, or that he should recover rapidly. Every day the cure is expedited, takes money out of his pocket, and bread out of the mouths of his family.

HEALTH is, to every organised being, the condition

of perfect development; to every sentient being the condition of happiness.

HEALTH, in a human being, is the perfection of bodily organisation, intellectual energy, and moral power.

HEALTH is the fullest expression of all the faculties and passions of man, acting together in perfect harmony.

HEALTH is entire freedom from pain of body, and discordance of mind.

HEALTH is beauty, energy, purity, holiness, happiness.

HEALTH is that condition in which man is the highest known expression of the power and goodness of his Maker.

When a man is perfect in his own nature, body and soul, perfect in their harmonious adaptations and action, and living in perfect harmony with nature, with his fellow-man, and with God, he may be said to be in a state of HEALTH.

If the organs of the body are all fully developed and in full action, they must necessarily be in harmony; and when a man is in harmony in himself, he is of necessity in harmony with all men, all nature, and with the Source of all things.

It is therefore necessary that every minute organ of the body, every faculty of the mind, every power of the soul should be fully formed and active—all balancing and harmonising each other; that man should act out all the fulness of his nature, and woman all the glorious beauty of her character, in perfect freedom, and in full enjoyment, to make up the integral condition of HEALTH.

BEAUTY is the first sign of health. Health gives development; and harmonious development is beauty. Every vegetable and every animal is beautiful, according to its own type of beauty, when it is most perfectly

developed. And in man or woman, the exact development of every part, and that which enables it to best perform its function, is the highest possible beauty. The handsomest possible head is the one which has the most perfect phrenological developments. The most beautiful eye, ear, or nose, are those best adapted to seeing, hearing, and smelling. The loveliest mouth has the best shaped lips and most perfect teeth. The most delicious bosom is the one best fitted for its natural office. The finest limbs are those with the best muscular development. In a word, there is no part of the human figure where the best condition for use is not, at the same time, the condition of the highest beauty, and both together are synonymous with health. Consequently, every deformity, every ugliness, every departure from the standard of the highest beauty of its kind, is a consequence and symptom of disease.

O ye, who love beauty, and who desire it for yourselves, for your offspring, and for the race, learn that the single way to attain it is by the practice of the laws of health. Be good, and you shall be beautiful as well as happy. Let no man who has a love for nature and a reverence for God undervalue beauty. It is to be sought, admired, loved and worshipped.

Another symptom of health is ACTIVITY. Every healthy nerve has a desire to use its power; every healthy muscle wishes to contract; every healthy faculty wishes to find exercise and consequent enjoyment. This rule extends to the organic, as well as the animal system. In health the secretions are active, and so are the excretions; there is a sharp appetite, quick digestion, a full circulation, an earnest respiration, and everywhere an active nutrition. Body and mind are active. All the passions spring into spontaneous activities, alternating with each other, and all contributing to that great variety of action and sensation which constitute the complex phenomenon of Life.

Indolence, on the other hand, is a consequence and a sign of disease. A torpid organ is a diseased organ. A lazy man is a sick man. Give him health, and his laziness will vanish. Every well man is a busy man. There is no tendency to indolence in a healthy person. The real tendency is to high activities; and the healthier the world grows, the more varied and active will be its industry.

STRENGTH, or energy, is a sign of health; though a kind of discordant strength, or spasmodic energy, may be a mark of disease. But steady power comes from integrity of constitution. There must be good brain, good nervous fluid, and good muscular fibre, before we can have real strength, and true persistent energy of character and action. These must come from a deep vitality. Men of strong desires, strong passions, strong wills, have strong lives; and a strong life is generally a long and healthy one.

Weakness—mental, or passional, or physical—is a sign of disease, as it is a consequence. It is want of development, or exhaustion, or hereditary taint, or acquired morbid condition, or all together, one producing the other. If we blame the weak, the vascillating, the craving, the spiritless, nerveless, hopeless, purposeless, we must blame them only for what has brought them to this condition. It is a condition of disease, which, if possible, we must cure.

HAPPINESS is a sign of health, and withouth health a full enjoyment of life cannot exist. A condition of happiness is said to be "a sound mind in a sound body." This is a simple description of a healthy condition. Happiness is the end or final cause of all sentient life. There is no other conceivable reason for the creation of any being. Happiness is, therefore, the positive and necessary result of every true life, as misery is the inevitable, because equally necessary, result of a false life. As health is the condition

of a true life, the result and sign of health is happiness.

Hence all unhappiness of every kind, all pain, grief, regret, jealousy, discontent, anxiety, is the result of disease, bodily or mental, in ourselves or others. Sorrow seems to me just as much the effect of a disease as pain. One is the outcry of a sick organism, the other of a wounded spirit. We feel sorrow by sympathy with others; and there are many persons of sensitive organisations who feel bodily pain the same way. The way to be happy is to be healthy; and when health is universal, there is no conceivable reason why there should be any unhappiness. There is no happiness without a corresponding degree of health, and no health without a corresponding degree of happiness.

CHAPTER XIII.

THE CONDITIONS OF HEALTH.

As health is the simple, natural state of man, when his whole development and life are in accordance with the laws of his being, the CONDITIONS OF HEALTH are entirely based on the science of physiology or anthropology.

What I prefer to call the conditions of health include the whole science of hygiene, and these conditions are the basis of the laws of life. Without a full observance of them, no human being can have health, which includes in itself beauty, activity, energy, happiness. Without a full observance of them, humanity is liable to ugliness, deformity, pains, and every complication of misery, all of which are included in the idea of disease.

These conditions of health cannot be observed, if they are not known. We have so neglected a knowledge of ourselves, so perverted ourselves, so far gone astray from nature, that a pure, simple, natural life is almost unknown to us. Our souls are perverted by unnatural beliefs, notions, and habits of thought, as our bodies are by absurd customs, fashions, and habits of action. There is a curious correspondence between our mental and bodily perversions. In both ways, we are out of harmony with nature, and at discordance in ourselves.

The first condition of health to every living thing is to be well begotten. The farmer who wishes good crops, selects his seed with care. He does not expect large, clean, sound wheat from small, smutty, shrivelled seed; healthy lambs from diseased sheep and rams; good cows and strong oxen from a poor, diminutive breed; nor a beautiful, fleet horse from an inferior stock. Man is also an animal, and subject to all the laws of hereditary descent which govern the propagation of other animals.

Diseased parents beget diseased children; and the reverse. Long-lived parents beget long-lived children; and *vice versa*. There are causes which operate upon the individual in both cases, to modify the effects of hereditary predisposition. A man, gifted with a good constitution from his ancestry, may destroy the principle of longevity in his offspring, though he may live to a good age himself. So a man may transmit to his children a vigorous life-principle, which he may afterwards undermine in himself by his own bad habits. He may die early, in spite of a good constitution; while his children, inheriting his healthy organisation, may be more fortunate in preserving it.

To be well begotten, one's parents must not only be of a good stock, and have inherited and developed a good organisation, but they must be actually living

healthy lives, and observing the conditions of health. Any unhealthy condition of the father affects the seminal fluid. For this to be pure and strong and vital, the blood and the nervous power must be in the same condition, and so of the germs prepared by the mother. No unhappy man, no diseased man, no man whose nervous power is exhausted by labour or care; no man who poisons his blood, and disorders his nerves with stimulants and drugs, can possibly beget a healthy child. Every zoosperm prepared in the testes for the fecundation of the ovum is affected by every cause that affects the parent. There is no condition of body or mind, with which the germ of life may not be affected by either of the parents. The seeds of all follies, vices, and crimes are sown in the organism. The Bible truly says of men, that they had certain characters "from the mother's womb." Moral character, intellectual powers and tendencies, physical organisation, health or disease, happiness or misery, are impressed upon the infinitesimal germ, and the inconceivably minute zoosperm. The microscopic animalcule, shaped like an elongated tadpole, is, in reality, a blackguard, a liar, a thief, a scoundrel; or it is scrofulous, or syphilitic, or gouty; or it is idiotic, or insane: all these, if formed by a parent of whom these are actual qualities. And so it is of the germ prepared in the ovary of the mother. So the sins of parents are visited on their children to the third and fourth generation, and, where the causes continue, to the thirtieth and fortieth.

Father and mother, therefore, at the time of begetting, must be in all pure, and natural, and healthy conditions. If the parents love each other, the child will love its parents. But if a woman submits to be impregnated by a man whom she loathes and hates, that loathing and hatred will be impressed upon the child. It will show it in infancy, and it often lasts through life. Mr. O. S. Fowler gives an account of a man who

had never been able, from his birth, to look at his father, from the impression made upon him by the mother, previous to and during pregnancy. For these reasons, if for no others, sexual commerce should never take place but in a most loving union of congenial souls. Two persons may have sworn eternal love upon a "stack of Bibles;" but if they do not love, they have no right to have children. Sexual union should never take place in sickness, or depression, or fatigue, nor under the influence of stimulants. Mr. Combe has given a case in which an idiot was the product of sexual union during a drunken frolic. The world is full of miserable wretches, the results of sexual commerce forced upon a loathing wife by a drunken husband.

And from this primary condition of health comes the law, that every woman, by her supreme right to herself, has the right to choose when she will have a child, and by whom. She is to carry it, to bear it, to nurse it, to educate it; she is responsible to her child for its paternity and its development; and this responsibility carries with it the right of choice in all that affects it.

When men are once enlightened on this subject, none but inhuman wretches and monsters will deny these rights. We talk of the evils of slavery, and of the submission of female slaves to their masters' lusts. Look at the slavery of women over the civilised world, and their submission to the lusts of *their* masters.

Nature is ever kind, and neglects nothing that can benefit her creatures. She exerts her power to preserve the race, even from these evils. What some doctors call the *vis medicatrix naturæ*—the healing power of nature, which tends constantly to growth and healthy development, which heals our wounds, and cures our diseases when we give it a chance, and it is possible to do so; this power operates ever to purify, strengthen, and elevate. It does much to save the

child from the diseases of the parent, and children are often better than we could expect. With all things in nature working together for good, we must not despair, but try to improve by culture and education. With good conditions, and surrounded by good influences, the faults and diseases of birth are gradually eradicated and cured, until scarcely a sign of them remains; and children, born ugly, diseased, and with unfortunate mental and moral tendencies, may come to be more beautiful, healthy, and good than seemed possible in their infancy.

The second condition of health is, that a child should be well born, or, more properly, well *borne*. The whole state of the mother, during the period of pregnancy, influences the being of the child. Her blood is its nutriment, and that blood must be pure. It is from her nervous system that it derives the elements of its own vitality. Its mental and moral organisation is influenced by hers, and even by her thoughts and feelings. Its muscular structure may be made strong by her taking proper exercise, or weakened by her indolence. Children are born with club feet, because mothers would take no exercise during pregnancy. Children are born with dyspepsia, or a tendency to colic, from the mother eating improper food at this period. The food of the mother has so much to do with the condition of the child, and with her power to bring it forth at the proper period without pain or danger, that few things are more important. Numerous experiments prove that a fruit diet, or one composed chiefly of fruit, is the best possible. Too much farinaceous food, especially wheat, promotes the premature hardening of the bones, diminishes the flexibility of the fœtus, and increases the difficulty of parturition. No well-informed human mother will live on the flesh of animals during either gestation or lactation. Flesh is not fit to make babies, nor milk to

d them. There is no condition of the mother, ntal or physical, which may not have its influence on the child. How careful, then, should every other be to live in the best possible conditions during this period; and how careful should all around her be to make her life happy! There is no condition of health necessary to the mother, which is not also necessary to the child, for it partakes of all her life.

When we reflect upon the poverty, material and spiritual, that exists everywhere; upon the discord that enters into the lives of those who are most fortunate; upon the evil habits of living that surround us; and all the vices and miseries by which women are enveloped, and to which they are exposed, can we wonder that half the children born die before they are five years old; that thirty years is the average length of human life, and that, with so many, this brief space is filled with pain and misery? Pork, tea, coffee, tobacco, beer, whisky, crowded and filthy dwellings, bad air, uncleanly habits, and corresponding pursuits, feelings, and passions, are not the materials of which healthy babies are made. Such babies die, must die, and ought to die. They are not fit to live, and such a life, when it is prolonged, is a curse, and not a blessing.

The same law applies, during the period of nursing, to the mother or the nurse. Every mother should nurse her own child, unless it would be better off without it. A healthy hired nurse is better than a diseased mother; but the life and habits of the nurse must be under the same control as the mother's. Neither mother nor nurse, during lactation, should ever be exposed to sexual excitement. Amative indulgence diminishes the quantity of milk, and hurts its quality. And where this indulgence excites menstruation, and results in pregnancy, there is a double misfortune. The child at the breast and the child in

the womb are both defrauded. There is no doubt that the milk of a healthy, well-behaved cow is better for a child than that of a sickly or vicious mother or nurse. The food, the air, exercise, the feelings, employments, and the whole state of body and mind, influence the quality of the milk. The milk of an indolent mother will not give strength to the child. Even cows kept up in stalls, give milk with much butter and little of the flesh-forming principle, or caseine. All narcotics, all stimulants, all drug poisons, all impurities in food, or air, or about the person, affect the milk, and the child who feeds upon it. Many a child is kept drunk on tea, or tobacco, or whisky. The nurse drinks her porter or whisky, and the baby grows stupid on milk-punch, drawn from her bosom. And it is "such a good child!" "Nurses and sleeps all the time." These are some of the ways in which children are poisoned, killed outright, or made stupid drunkards. Tons of opium are given to the infants of the poor, and they die by thousands in consequence; but there is not much mourning on account of this murder of the innocents.

Natural food is a condition of health to every organised being. A plant finds its appropriate nourishment in the air, or draws it from the earth. We do not expect a vegetable to flourish in an uncongenial soil, because it is the soil that furnishes a portion of the matter necessary to its growth. It is the same with animals. Every one, from the smallest to the largest, is furnished with its appropriate food by bountiful nature; and every animal but man eats in a natural state the food that nature intended. The superiority of man over all other animals, is proved by the extent of his perversions. His greater capacity and freedom, which enable him to do greater and nobler deeds, enable him at the same time to do meaner and more debasing ones.

Vegetables, by careful effort, may be made to grow in soils not specially adapted to nourish them, and in climates not best adapted to their production. So animals may be educated to live on unnatural diet, but this is never a condition of health. Thus cows upon a barren sea-shore learn to live on fish; a sheep has been taught to eat beefsteak and drink coffee; and a horse has acquired the filthy and disgraceful habit of chewing tobacco. But no sane man will say that these things are natural or healthy.

In the same way man learns to eat and love a great variety of unnatural and hurtful articles of food, such as are not adapted to his digestive organs, or the best nutrition of his system. He also learns to tolerate and love the most nauseous and detestable poisons, of which the wide-spread use of tobacco is a remarkable instance.

Man has, in accordance with the energy of his nature, and the versatility of his powers, a greater range of adaptiveness than any other animal. He can live in all climates, by the aid of artificial protection and heat, and he can live on a wide range of alimentary substances.

But all experience, all observation, and all science, prove that there are certain kinds of food especially adapted to the constitution of man—the same as in the case of other animals; and this food is best for health in its widest and most comprehensive meaning.

The essential nutriment of vegetables consists of four elements: oxygen, hydrogen, carbon, and nitrogen. These are all found in the atmosphere, in water, and the earth. The same elements are the most essential in animal organisations, but in animals they are obtained from the vegetable kingdom. Thus the vegetable kingdom rests upon the inorganic, and the animal upon the vegetable.

Though all animals live upon the products of the

vegetable kingdom, and though there is no particle of animal nutriment in the world which has not been elaborated by the vegetable kingdom from the inorganic, yet there are many animals who get this food at second-hand, and in various stages of impurity and disease.

Animals may be divided into three classes; the herbivorous, or vegetable-eating animals; the carnivorous, or flesh-eating; and the omnivorous, or those who feed upon both. Of vegetable-eating animals we have some who live upon the grasses and other coarse vegetation, such as the horse, cow, sheep, camel, elephant, etc., and others who live upon fruits, seeds, nuts, and roots. Of carnivorous beasts, we have some living on freshly killed animals, as the lion, tiger, panther, etc., while others feed on carrion, as the hyena, wolf, and many birds. The hog is the type of the omnivora. It eats everything—snakes, toads, carrion, excrement, as well as nuts, seed, fruits. Man, also, is held to belong to this class, and to be even more omnivorous than the hog himself. That he is so by perversion and habit, I shall not deny; but that he ever is so, in a natural and healthy state, all nature and all science deny.

Man has not the claws, nor the teeth, nor the digestive organs, nor the tastes or attractions of a carnivorous animal; neither has he those of a grass-eating animal. The teeth of a carnivorous animal are formed to tear, and rend, and cut in pieces. Man's teeth are made, the front for cutting, the back for mashing and grinding. Those of grass-eating animals are adapted to a peculiar cutting and grinding process, necessary for the comminution of

Fig. 43.—Skull of Carnivora.

coarse vegetable fibre. The digestive canal of the carnivora is shorter and simpler than that of man; that of the graminivora, or grass-eating tribes, is longer and more complicated.

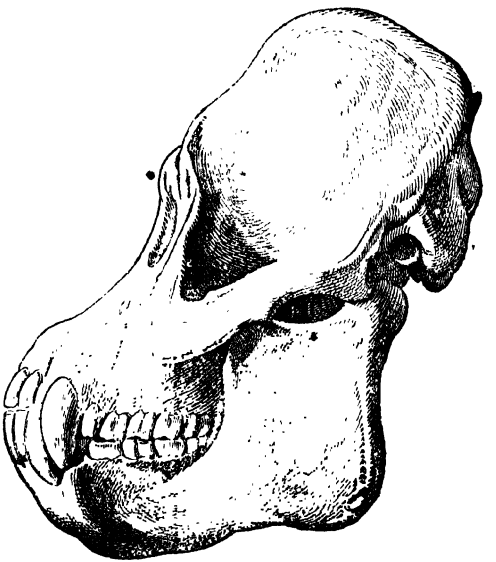

Fig. 44.—Skull of Orang Outang.

The animals whose teeth, digestive organs, and general physiology bear most resemblance to man, are of the class of frugivorous, or fruit-eating animals, at the head of which, and most resembling man, is the orang outang. This is a strong, active animal, growing to nearly the size of man, which lives on fruit, nuts, and roots.

The unperverted tastes of every animal point with unerring certainty to its natural diet. Wherever a decaying carcase taints the air, there will be found the foul creatures that feast on carrion—the hog, the hyena, the wolf, the crow, the buzzard, the vulture. Worms and insects finish the feast. The lion and tiger revel in the warm blood of the animals they have just slain, but turn away from carrion.

Now what are the natural tastes and attractions of man in respect to food. Reader, you shall be my judge. Let me take you by the hand, and lead you into this garden. It shall be, if you please, the Garden of Eden. Trees loaded with fruit are around you—vines bending with luscious grapes, beds filled with melons. Here are apples, pears, peaches, plums, nectarines, grapes, figs, oranges, bananas, strawberries, raspberries, and more than I can count. Here, also, are esculent roots, and nutritious seeds, fields of waving grain or golden maize, potatoes, beets, turnips. The air is filled with delicious odours; every object is full of beauty. Happy children are gathering fruit, or plucking flowers. All around are life and harmony, sweetness and purity, peace and happiness. The farm, the garden, the orchard, the vineyard, are full of beautiful associations, and not one object, if it properly belongs there, is offensive to the most refined taste.

Now, let us look upon another picture. A fœtid, sickening odour fills the air; shrieks and moans of agony salute you; the gutters run full of blood, but you must enter. A raging bull, with his frenzied eye glaring upon his murderers, is dragged up with horrid bellowings; a dull blow falls upon his skull, and the blood gushes from his throat. The strong, honest ox, who has toiled all his life for man, is murdered. The timid sheep, with painful bleatings, now feels the knife at its throat, and gasps away its innocent life. Calves,

torn from their mothers, are hung up by their feet, their veins opened, and allowed to slowly bleed to death, that the veal may be white, drained of its blood, and tender, from the long death-agonies. Around you are the opened carcases of these, your fellow-creatures, and your friends—the floor is covered with their blood and entrails.

What sense is gratified by such a scene as this? Is it beautiful to the sight, pleasant to the ear, grateful to the smell, or does it awaken any calm or happy feeling?

If a man wished to take a walk with one he loved, would he go to a garden, or a slaughter-house? If he wished to send her a present, would it be a basket of fruit, or a string of sausages?

Man loves the vegetable world, and finds it full of beauty, and attraction, and gratification, because it is his. His nature is adapted to it; it is adapted to all his wants, and all his natural desires. It is not so with carnivorous and carrion animals. What care the lion, or tiger, or wolf, or hyena, or buzzard, for orange groves and fig trees, orchards and vines, fields of waving corn, or granaries with their rich winter stores?

Flesh-eating physiologists and physicians have contended for the necessity, if not the beauty, of eating animal food; but all experience, all science, and all philosophy, are arrayed against them. At this moment, and in all past time, nine-tenths of the whole human race have lived on a vegetable diet, either eating no flesh or making it the rare exception. The great mass of the labour of the world is done on a vegetable diet. In Japan, China, the whole East Indies, Persia, Turkey, all Europe, save the sea-coasts, all Africa, and Central America, flesh is seldom or never eaten by the poor, and over much of this territory, not even by the rich. The finest forms, the best teeth, the strongest muscles, the most active limbs in the world, are fed

on a purely vegetable diet; while with regard to intellectual and moral development, it is a curious and interesting fact, that there can scarcely be mentioned a great philosopher or poet of ancient or modern times who has not given his testimony, either in his opinions or his practice, in favour of a vegetarian diet. Those who have any doubt on this subject, will do well to examine it fully.

In the Chemistry of Man, I have shown that not only are all the elements which are needed by the blood, and which enter into the human organism, found in vegetables; not only the ultimate elements, as carbon, oxygen, hydrogen, nitrogen, but the proximate elements, as albumen, fibrin, and fatty matter. And these elements are there in great abundance, and in great purity; in many cases in just the proportions in which they are needed, and free from all taint of disease. This is never the case with flesh used as food. The nutritive matters it contains are in wrong proportions, *and always mixed with the excrementitious matters passing out of the animal system, and often with the matter of disease;* for there are few animals fattened for slaughter, that are not diseased in the process, by being deprived of the conditions of health. Thus the flesh of the healthiest animal contains much waste and poisonous matter; while thousands of those eaten every day are one mass of disease. The details on this point are too disgusting to be written. We have only to read in the journals of the quantity of diseased and putrefying flesh condemned by the inspectors.

Fruit and the farinacea are the natural, and, therefore, the most healthy food for man. They are best fitted to sustain him in vigour of body and mind. They preserve him in health, and enable him to recover from disease. They contain all the elements he requires in the best proportions and in the best condition. A vegetarian diet is preëminently the diet

of beauty, energy, activity, and enjoyment. It is the best at all ages, in all conditions, in all employments. It is the best for the labourer, as for the philosopher, the artist, the professional man, or the man of the world. On a vegetable diet, the skin grows clear, the cheeks rosy, the eyes bright, all senses acute, the wits sharp, the intellect vigorous, the feelings deep and pure, the digestion good, all functions regular, the passions under control, the temper calm, the intuitive perceptions quickened, and the whole being exalted into a new, more vigorous, and more beautiful life.

The diet most consistent with health, is one composed of the best ripe fruits, as strawberries, raspberries, whortleberries, peaches, pears, apples, grapes, melons, tomatoes, oranges, bananas, figs, dates; wheat, Indian corn, rice, oatmeal, rye, barley; peas, beans, lentiles; asparagus, potatoes, beets, turnips, squash, cabbage, salsify, egg-plant, etc., etc. There is a vast variety, of which hundreds of the most exquisite dishes may be made. If we add two articles from the animal kingdom, procured without destruction of life, and which may generally be had in a state of tolerable purity, our list, if not complete, is sufficient for every reasonable desire—I mean milk and eggs. These furnish us with a concentrated aliment of agreeable flavour, and they mingle harmoniously with most vegetable substances.

The quantity of food, many persons say, who wish to gratify perverted tastes, is of more importance than quality. Each has its own special importance; but when a man eats food of the proper quality, he is not so apt to err in quantity, and his errors are not so mischievous. It is surely worse to eat too much of a bad thing, than too much of a good thing. A man is much more apt to kill himself with brandy than with potatoes. Vegetarian gluttons exist, doubtless, especially among those who have become diseased on

other modes of diet; but they are not so common, I imagine, as among "riotous eaters of flesh."

The proper quantity of food for a mature healthy person should include about twelve ounces of nutriment per day. This is contained in rather less than one pound of farinaceous food, two pounds of potatoes, and what are called vegetables, and a still larger quantity of fruit.

Food may be taken, in early infancy, every two or three hours; and the frequency should be gradually diminished, until, at a year old, the child takes but three meals a day. For the adult, three meals, at intervals of six hours, seems a natural arrangement, though many persons advocate eating but two meals a day. The last meal, when three are eaten, should be lightest in quantity, and most easy of digestion.

The rules for eating are much like those of other functions. Hunger is nature's call for food, and supply should be governed by demand. We should never, when in health, eat but when we are hungry, nor drink but when we are thirsty. We should masticate thoroughly, which insures a proper insalivation. Even when the food is so soft as not to really require chewing to be swallowed, it ought to be well mixed with saliva. If the food be simple and pure, not too much sweetened or salted, nor prepared with exciting condiments, the sense of hunger is soon overcome, appetite is satisfied, and we feel that we have eaten enough.

We should never eat when fatigued, nor in any way exhausted; nor should we commence violent labour, bodily or mental, nor take a bath, immediately after eating. In the first case we prevent, in the second we interrupt, digestion. We want a large portion of our strength for digestion, and a good digestion gives us strength for every other purpose. Moderate exercise and pleasant mental excitement, as conversation or some amusement, rather favour the digestive process.

Salt, if necessary at all, which recent experiments lead us to doubt, should be taken in great moderation. Vinegar, lemon juice, or such mild vegetable acid, though not necessary, may be added to some vegetables without apparent injury. Sugar is a concentrated form of nutriment, difficult to digest in large quantities itself, and having, like salt and vinegar, the power of preserving other substances not only from fermentation out of the stomach, but from digestion in it. Thus, fruit preserves are very hard of digestion, and must be eaten with great caution. Pepper, spices, mustard, and all heating and stimulating sauces, should be used very sparingly, if at all. Greasy food, melted butter, and pastry, are of difficult digestion.

Hot drinks debilitate the stomach, as the hot bath does the skin. Tea and coffee, like tobacco and ardent spirits, are narcotic poisons, which, for a time, stimulate, but finally weaken and destroy the nervous system. The best drink is *pure, soft, cold water.*

The nutriment in food should be mixed with a certain proportion of innutritious matter. In all fruits there is a proportion of woody fibre; also in roots, and in the bran of wheat and corn, and the skins and shells of other vegetables. The most perfect farinaceous food is unbolted wheat, either boiled or made into bread. Men can live very well on ten or twelve ounces of wheat a-day, with water for drink. Less wheat, with a portion of fruit, however, is better. Coarse wheat bread, or porridge, fruit, a little milk, make a beautiful and excellent diet. Maize is nearly as good as wheat—it may be even better for some constitutions. With it we can better do without milk or its products.

I add some tables, taken from standard authorities, which embody many important facts on diet. It is to be borne in mind that this system of living, besides being the most natural, the purest, the most beautiful,

the healthiest, and the best, is also far the cheapest. No article of food costs so much, in soil, and labour, and care, as flesh. The corn given to a hog to fatten him, would feed a man more than ten times as long as the pork into which it is converted. There is no comparison for health and purity.

The following table presents the numbers expressing the composition of the principal kinds of food made use of, as well as that of flesh; thus affording a comparison of the nutriment of each article of vegetarian diet, with that of the flesh of animals.

The conclusions of this table are from the results of analyses by Playfair, and other chemists of established repute; and the separation of their parts of nutriment into flesh-forming principle, heat-forming principle, and ashes, is in relation to the necessary elements of food suited to the wants of the body, according to the views of the modern school of Chemistry, after Liebig.

WEIGHT.	ARTICLES OF DIET.	CONTAIN:		AND SUPPLY TO THE BODY:		
		Solid Matter.	Water.	Flesh-forming Principle.	Heat-forming Principle, with Innutritious Matter.	Ashes for the Body.
lb.		lb.	lb.	lb.	lb.	lb.
100	Turnips.....	11·0	89·0	1·0	9·0	1·0
"	Red Beet Root..	11·0	89·0	1·5	8·5	1·0
"	Carrots.....	13·0	87·0	2·0	10·0	1·0
"	Flesh..... ..	25·0	75·0	25·0	.....	...
"	Potatoes.....	28·0	72·0	2·0	25·0	1·0
"	Bread (stale)....	76·0	24 0	10.75	64·25	1·0
"	Peas..... ..	84.0	16·0	29·0	51·5	3·5
"	Wheat-meal.....	85·5	14·5	21·0	62·0	2·5
"	Beans.....	86·0	14·0	31·0	51·5	3·5
"	Maize-meal.....	90·0	10·0	11·0	77·0	2·0
"	Oatmeal.....	91·0	9·0	12·0	77·0	2·0
"	Rice..... ..	92·4	7·6	8·4	82·0	2·0

The only direct evidence upon the digestibility of food in the human stomach, of indisputable import, is that published by Dr. Beaumont as the result of his observations in the case of Alexis St. Martin. The few following statements, expressing the digestibility of various articles of ordinary consumption in hours and minutes, are abstracted from the tables containing the results of his carefully conducted experiments:—

Articles of Vegetarian Diet.	H.	M.
Soft Boiled Rice	1	00
Barley Soup	1	30
Boiled Tapioca, Barley, Milk	2	00
Potatoes, Beans, Parsnips	2	30
Eggs (variously cooked)	2	37
Custard	2	45
Bean Soup	3	00
Bread (fresh)	3	15

Articles of Flesh Diet.	H.	M.
Chicken Broth	3	00
Roast Beef, Beefsteak	3	00
Chicken	3	15
Roast Mutton	3	15
Mutton Soup	3	30
Broiled Veal	4	00
Roasted Duck	4	15
Roasted Pork	5	15

In relation to the economy of vegetable food, Dr. Lyon Playfair stated, some years ago, at Drayton Manor, the residence of Sir Robert Peel, at a meeting of a great many distinguished men, that, "at London prices, a man may lay a pound of flesh on his body with milk for 3s., with turnips at 2s. 9d., with potatoes carrots, butchers' meat without fat or bone, at 2s., with oatmeal at 1s. 10d., with bread, flour, and barley-meal at 1s. 2d., and with beans at less than 6d."

It is calculated that fifteen persons may live on vegetable food, on the same land that would support one with flesh. Some English estimates are more remarkable. Twelve acres are required to feed a man with beef alone; but on potatoes alone, he can live on the produce of one-ninth of an acre. Potatoes alone do not constitute a good diet, but millions have lived very well on potatoes and buttermilk. These facts throw a flood of light on the population question

With a purely vegetarian diet, the Island of Great Britain, under thorough culture, could sustain one hundred millions of inhabitants. Now, a large part of the soil is wasted on cattle and game.

Another English estimate is given in the following table, which has many points of interest:—

ESTIMATED PRODUCE OF AN ACRE OF LAND.

	Per Year.	Per Day.
Mutton,	228 lbs.	10 oz.
Beef,	182 ,,	8 ,,
Wheat,	1,680 ,,	4½ lbs.
Barley,	1,800 ,,	5 ,,
Oats,	2,200 ,,	6 ,,
Peas,	1,650 ,,	4½ ,,
Beans,	1,800 ,,	5 ,,
Rice,	4,565 ,,	12½ ,,
Indian Corn,	3,120 ,,	8½ ,,
Potatoes,	20,160 ,,	55 ,,
Parsnips,	26,880 ,,	74 ,,
Carrots,	33,600 ,,	92 ,,
Yams,	40,000 ,,	110 ,,
Turnip,	56,000 ,,	154 ,,
Beet,	75,000 ,,	205 ,,

"Adam Smith, in his *Wealth of Nations*, informs us: 'That the most beautiful women in the British dominions, are said to be, the greater part of them, from the lower ranks of the people of Ireland, who are generally fed with potatoes. The peasantry of Lancashire and Cheshire, also, who live principally on potatoes and buttermilk, are celebrated as the handsomest race in England.'

"The peasantry of Wales, Norway, Sweden, Russia, Denmark, Poland, Germany, Turkey, Greece, Switzerland, Spain, Portugal, and almost every country in Europe, from the most northern part of Russia to the Straits of Gibraltar, subsist principally, and most of them entirely, on vegetable food. The Persians, Hindoos, Burmese, Chinese, Japanese, the inhabit-

ants of East Indian Archipelago, of the mountains of Himalaya, and, in fact, most of the Asiatics, live upon vegetable productions. The great body of the ancient Egyptians and Persians confined themselves to a vegetable diet; and the Egyptians of the present day, as well as the Negroes (whose great bodily powers are well known), live chiefly on vegetable substances. The brave Spartans, who for muscular power, physical energy, and ability to endure hardships, perhaps stand unequalled in the history of nations, were Vegetarians. The departure from their simple diet was soon followed by their decline. The armies of Greece and Rome, in the times of their unparalleled conquests, subsisted on vegetable productions. In the training for the public games in Greece, where muscular strength was to be exhibited in all its varied forms, vegetable food was adhered to, but when flesh-meat was adopted afterward, those hitherto athletic men became sluggish and stupid. 'From two-thirds to three-fourths of the whole human family, from the creation of the species to the present time, have subsisted entirely, or nearly so, on vegetable food, and always, when their alimentary supplies of this kind have been abundant, and of good quality, and their habits have been, in other respects, correct, they have been well nourished and well sustained in all the physiological interests of their nature.'

"LINNÆUS, one of the most celebrated naturalists that ever lived, speaking of fruits, says: 'This species of food is that which is most suitable to man; which is evinced by the series of quadrupeds, analogy, wild men, the structure of the mouth, of the stomach, and the hands.' M. DAUBENTON, the associate of Buffon, observes: 'It is, then, highly probable that man, in a state of pure nature, living in a confined society, and in a genial climate, where the earth required but little culture to produce its fruits, did subsist upon these,

without seeking to prey upon animals.' GASSENDI, in his celebrated letter to Van Helmont, says: 'Wherefore I repeat, that from the primeval and spotless institution of our nature, the teeth were destined to the mastication, not of flesh, but of fruits.' Sir EVERARD HOME says: 'While mankind remained in a state of innocence, there is ground to believe that their only food was the produce of the vegetable kingdom.' BARON CUVIER, whose knowledge of comparative anatomy was profound, and whose opinion, therefore, is entitled to the greatest respect, thus writes: 'Fruits, roots, and the succulent parts of vegetables, appear to be the natural food of man; his hands afford him a facility in gathering them; and *his short, canine teeth, not passing beyond the common line of the others*, and the tubercular teeth, would not permit him either to feed on herbage, or devour flesh, unless these aliments were previously prepared by the culinary processes.' RAY, the celebrated botanist, asserts: 'Certainly, man by nature was never made to be a carnivorous animal, nor is he armed at all for prey or rapine, with jagged and pointed teeth, and crooked claws, sharpened to rend and tear; but with gentle hands to gather fruits and vegetables, and with teeth to chew and eat them.' Professor LAWRENCE observes: 'The teeth of man have not the slightest resemblance to those of carnivorous animals, except that their enamel is confined to their external surface. He possesses, indeed, teeth called canine; but they do not exceed the level of the others, and are obviously unsuited to the purposes which the corresponding teeth execute in carnivorous animals. * * * Thus we find, that whether we consider the teeth and jaws, or the immediate instruments of digestion, the human structure closely resembles that of the simiæ, all of which, in their natural state, are completely frugivorous.' Lord MONBODDO says: 'Though I think that man has,

from nature, the capacity of living either by prey or upon the fruits of the earth, it appears to me, that by nature, and in his original state, he is a frugivorous animal, and that he only becomes an animal of prey by acquired habit.' Mr. THOMAS BELL observes: 'The opinion which I venture to give has not been hastily formed, nor without what appears to me sufficient grounds. It is, I think, not going too far to say, that every fact connected with the human organisation goes to prove that man was originally formed a frugivorous animal, and therefore tropical, or nearly so, with regard to his geographical position. This opinion is principally derived from the formation of his teeth and digestive organs, as well as from the character of his skin, and the general structure of his limbs.'"

The natural drink—really the only drink of man—is water. Every mixture with it is of food or drugs. Wine, beer, etc., are alcohol, sugar, fruit, juices, etc., and water; but the water is the drink. The purer the water, the freer from animal, vegetable, and mineral admixture, the better. It is an entire mistake to think hard water better than soft. The water of Malvern is the purest and softest in England, and the most delicious. But there is no part of this country in which an abundant supply of pure soft water may not be had for drinking and culinary uses, by having proper cisterns. They should be large, tight, and built, if possible, of flat stones; but they may be made of brick, covered with cement. The water should pass into them through a filter, made of alternate layers of fine sand and charcoal, which may be renewed once a-year. No lead should be used about a cistern, as rain-water dissolves it, while spring or river water generally does not. The pipes should be wood, tin, or gutta percha. There is one cistern in Constantinople capable of supplying that vast city with water for

sixty days. Perfectly soft and pure water may be obtained everywhere from hard or soft water, by distillation. All that is needed is a small still of iron or tinned copper, or even of common tin, with a tinned worm. Set over the kitchen fire, it will supply all the water for a family. The first water that passes over should be thrown away, and also the dregs. The water of the Malvern hills is simply rain water filtered through a pure vegetable loam, sand, and gravel.

Another condition of health is pure air. We can go for days without food, but not an hour without air. Respiration is the first act of independent life. We eat and digest at intervals, but we breathe continually. The stomach rests, but never the lungs. We need food every day, though not absolutely; but we must have air every minute. Air, then, of some kind, is a very vital necessity; and pure air, and plenty of it, is necessary to health.

The atmosphere is the great reservoir from which is obtained the most important materials of the organic world. It is a mixture of about four-fifths of nitrogen, one-fifth oxygen, from three to five ten-thousandths of carbonic acid, a trace of the nitrate of ammonia, and traces of phosphuretted and sulphuretted hydrogen. It also holds in solution a large quantity of water in vapour, which we see condensed into clouds, fog, dew, rain, etc. The atmosphere also contains and bears about odours of vegetables, and other aromal qualities, healthy and noxious. Of the latter are the miasms of intermittent and other forms of fever, and certain contagious diseases.

The relations of the atmosphere to man are various and important. Through the vegetable world it gives him food; it is the vehicle of sound; its weight or pressure is adapted to his organism; and he uses it in many mechanical appliances. But its great vital relation is to the blood, upon which it acts in the

lungs, and through the skin. The whole mass of the blood is constantly passing through the lungs, and so air is constantly brought into contact with the blood, in which it effects changes so important that life cannot go on without them. The blood must have oxygen, and be freed from its carbonic acid, or it soon clogs and poisons the system.

At every inspiration we take in many cubic inches of air. I have inhaled three hundred and twenty-five cubic inches at a single inspiration. Ordinarily, it is said, we inhale about seventeen cubic inches. When this air is expired, it contains less oxygen, more carbonic acid, and also various impure matters from the body. Some persons' breaths are terribly diseased, and this is often the case with flesh-eaters, and those who do not bathe, while the breaths of vegetarians and water-cure people are often as sweet as the breath of cows, and so are those of all perfectly healthy persons.

If a man is shut in a close room, every breath he breathes changes the quality of the atmosphere. Minute by minute it grows impure. It loses oxygen, becomes loaded with carbonic acid, and filled with excretory emanations both from the lungs and the skin. Put many persons in the room, and this process is increased in rapidity. In a railway carriage, steamboat, church, theatre, or concert-room, unless the greatest care is taken to ventilate them, by carrying off the foul air and admitting the pure, the atmosphere becomes totally unfit for respiration. It is debilitating from its want of oxygen, deadly from its carbonic acid, and poisonous from the filthy emanations of people filled with all sorts of diseases.

A pure air, then, is of absolute necessity to the blood. We must have quantity as well as quality. If respiration is impeded in any way, it is a cause of disease. The chest should be dilated to its utmost compass. It must never be cramped by a stooping

attitude. Every muscle of respiration must act with freedom. Neither the ribs, nor the muscles of the chest, nor the diaphragm, nor the muscles of the abdomen, which are the chief agents in expiration, should be in the least impeded by any dress or ligature.

By day and by night, at all times and in all places, sleeping and waking, we should have pure air, and breathe it plentifully. Of miasms, and other deleterious qualities to be avoided, I shall speak further on when treating of the causes of disease.

The principles and modes of ventilation are very simple. Whenever the air in a room is warmer than the outer air, a crevice, ever so narrow, at the top of a window, will ensure a rapid change. Two currents are instantly formed—an upper one of warm air leaving the room, and a lower one of fresh air taking its place.

Fresh air must also come into every room to take the place of the air which goes up the chimney. But in every house, in cold weather, the air for every room should be warmed before it comes into the rooms, which could easily be done by proper furnaces.

Next to food and air, as conditions of health, comes exercise. I use this word here in a wide sense. By it I mean the activity of all voluntary functions. These are placed under the law of exercise, and depend upon it for the integrity of their life.

As development of every organ is necessary to the harmony of the system—that is, to health—and as exercise is necessary to development, it follows that exercise is one of the most important conditions of health.

Nature provides us air and food. These a man may have in isolation. Robinson Crusoe, on his desert island, could breathe the purest air, and live upon the most delicious fruits; he could take all need

ful bodily exercises, and could find use for some of his mental powers in the study of nature. But he had no exercise for the higher passions of the soul. These demand society. On the exercise of these, all the most exquisite enjoyments of his life depend. A man must have the exercise of benevolence, of friendship, of ambition, of familism, of love. To have these, he must have society, extensive and varied enough to gratify all these passions in all their various developments. The soul pines, and withers, and dies in isolation. And as the soul suffers, the body also becomes weak and diseased. Our muscles become wearied with inaction; we long to use them, but by long disuse, they at last lose their power. So of the passions. We long to love and to be loved; we long for the sweet accords of friendship, and the inspiring stimulus of ambition; these longings are the weariness and *ennui* of the soul. Those who do not know their own natures, feel vague yearnings; those who have studied them more carefully, have more definite desires. These longings of the soul must be satisfied, or we can have no spiritual health, and the body reflects the soul.

In the world, as it is, all exercise, and, consequently, all development, is fragmentary. The blacksmith and the boatman have large arms, the dancer has fine legs, the musician is all tune, the painter all form and colour, an artist is nothing but an artist, a politician is but a politician, the man of fashion is a mere dandy. There is no complete human being anywhere. There is sharpness, and even force, in particular directions, but no integral development and universality of power. Where is the man who is all he should be in himself and in his relations to God, and nature, and society? Where is the woman, strong, beautiful, self-centred, brave, religious, honest, kind, friendly, loving, wise, accomplished, with a true pride, and a noble ambition;

strengthening the weak, guiding the erring, animating the despairing, the life and soul of her sphere; great and generous, and free?

In this word exercise lies the whole idea of education. A perfect analogy or harmony of action belongs to the whole system of animal organs, soul and body. Exercise gives both strength and facility of action. When we first sit down to the pianoforte how weak and bungling are our efforts to play. Day after day we accustom our fingers to obey the will, and to express the musical thought. Day by day it becomes easier to do so, and we soon learn to play rapidly, with ease, force, and expression, and without the least effort. The habit is formed. It is the same with every faculty and every passion. Every portion of the brain is susceptible of education, of gaining strength and facility by exercise, of forming good habits. Goodness is as habitual to the good as wickedness is to the wicked. It is as easy for men to be habitually brave, generous, noble, and just, as to be craven, stingy, mean, and dishonest. Men's hereditary character comes from the education of their ancestry; and in time it may be changed by the same agencies.

What men and women need for health are varied employments and amusements, attractive industry, pleasant society, the exercise and satisfaction of varied tastes, talents, and ambitions. All that can give happiness to man, promotes his health; all that can give health, promotes his happiness. Everywhere there is this reciprocal action, based upon the simplest laws. "Evils to man, and evils to man only, are sins against God." God can ask nothing of man but what is for his happiness; whatever promotes the happiness of man is therefore, pleasing to God. "Therefore, whether ye eat, or drink, or whatever ye do, do all to the glory of God."

Health demands, as its necessary conditions, then,

such parentage, birth, and blood, as shall secure a good, sound, well-developed constitution—"a sound mind in a sound body." It demands a pure and natural nutrition, or the observance of the laws of diet. It demands a pure air, or an observance of the laws of respiration. It demands the regular performance of all the organic and animal functions, secretions, excretions, and all muscular, nervous, intellectual, moral, and passional activities, which I have included in the law of exercise. It demands for the whole skin the cleanliness of daily ablution, without which its functions are not well performed. It demands a temperature neither so warm as to debilitate, nor so cold as to chill and stupefy; and for this purpose the clothing must be such as comfort requires, without impeding motion, aeration, or perspiration.

Dress, with many persons, and with all who are truly developed, is an art and a passion. Aside from comfort in regard to temperature; aside from its protection of our personality from those we have no sympathy with, and whose sight of our naked forms would be a profanation, dress is a mode of the expression of our sense of the becoming, the harmonious, and the beautiful, in texture, form, and colour. It is a language, a mode of life, a genuine out-growth of our natures, and is, therefore, a true necessity and a great enjoyment. Dress is, with many persons, a condition of health or a cause of disease. I do not speak of the vulgarities of tight lacing, nor the fettering absurdities of long skirts, sweeping the streets and crushing the spine; but of dress as beautiful or ugly, becoming or incongruous, harmonious or discordant. Be sure that an ugly, ill-fitting dress is a real cause of disease, and that a beautiful dress is both a cause and an indication of health.

The first quality of clothing is its cleanliness, the second is its comfort, the third is its fitness to our

form, age, employment, and condition; the fourth is its beauty and spiritual harmony. The dress becomes a part of our being.

Rest, and especially the rest of sleep, is a condition of health. The animal organs demand rest and restoration. Recreation from a change of employments and enjoyments is not enough. There must be absolute repose. The whole brain must rest, probably from a necessity connected with its nutrition. Nothing exhausts and prostrates us sooner than the want of sleep. Sound sleep is the sign as well as condition of health. The infant, when its mental powers are just beginning to act and get quickly wearied, sleeps nearly all the time. In childhood and youth we sleep ten or twelve hours of the twenty-four. In maturity we find eight hours sufficient, and in old age we do with less.

Sleep is full or partial, and in partial sleep we have strange combinations of memory and fancy, and sometimes of our higher powers of thought and intuition. In these dreams also, and visions of the night, when the senses are locked up in a semblance of death, our souls seem to be opened to the influences of higher states of being.

Sleep is made unhealthy by indigestion, bodily weariness, mental excitement, or inquietude, by disordered passions and unsatisfied desires; by bad air, too much or too little clothing, by that which shuts in perspiration, by a bed too hard or soft, and by all unnatural conditions. As we spend, at least, one-third of our lives in sleep, we may as well take a little care how we sleep, and who we sleep with; for it is a condition of health, that we sleep with a healthy and congenial person, if with any. We must sleep with those we love, and not with those we hate, or who are in any degree repulsive to us. We must not sleep with those who are diseased, unless we are willing to give them

our strength. The young must not sleep with the aged; it is too great a draft on their vitality. Children may sleep with the strong and mature, for there is a reciprocation of benefits. We radiate our lives, and partake of the radiations of others; but if we give much, and get little, we must be the losers. Men have a natural and proper repugnance to sleeping with each other, and so have many women, but not so much. In natural philosophy, like electricities repel, unlike attract. Physiology, or the science of nature, teaches us the conditions of health for every organised being. "Follow nature," was the true maxim of the old philosophers. We despise it for its simple brevity; but it contains all, and all that I have written, or could write in a thousand ages, on health or disease, would be but an amplification and illustration of this apothegm.

CHAPTER XIV.

THE CAUSES OF DISEASE.

DISEASE, in the sense in which I shall use it, as including also disorder, is the opposite, or the lack of health. It is "Any deviation from health, in function or structure, the cause of pain or uneasiness, distemper, malady, sickness, disorder, any state of a living body in which the natural functions of the organs are interrupted or disturbed, either by defective or preternatural action, without a disrupture of parts by violence, which is called a *wound*. The first effect of a disease is uneasiness or pain, and the ultimate effect is death. A disease may affect the whole body, or a particular limb or part of the body. We say a diseased limb, a

disease of the head or stomach, and such partial affection of the body is called a local or topical disease."

But the system is so bound up in common relations of sympathy, that no disease can be entirely local. The prick of the finest needle affects the whole system; and a very slight wound may bring on death by lockjaw. If there is any want of harmony in body or mind, it is disease. If there is inaction of any function, irregularity, excess, or any kind of discordance, it is a disease.

And as the great sign and result of health is pleasure or happiness, so the great symptom and effect of disease is pain or misery. And as we have pleasure in all degrees, from the simplest feeling of satisfaction to the keenest ecstasy, so we have all degrees of pain, from uneasiness to agony.

Diseases are divided by pathologists into general and local; but as there is no local disease which does not affect the whole system, so it is believed by many that there is no so-called general disease which has not some special locality, throwing the force of its morbid action upon some particular organ, either on account of its weakness, its excited condition, or some peculiar aptitude to receive it. Thus we have fevers, which are considered general diseases of the nervous system or the circulation, becoming brain fevers, lung fevers, bilious fevers, etc., according to the organ most affected.

Diseases are also divided into functional and organic. They are called organic, when some injury to, or alteration of the organ is perceptible; and functional, when it is not. Where there is organic disease, there must always be functional; where there is functional, there must be organic disease somewhere, though not necessarily in the part which appears to be affected. It may be in the nervous centres connected with it. Thus [illegible] by an affection of the spinal cord; and, if the heart, in most cases, comes from

POSTSCRIPT.

THE first edition of Esoteric Anthropology was published in New York in 1853; the revised and partly re-written English edition was published in 1873. I have no reason to complain of the success it has had, and much reason to rejoice at the good it has done. It has been the means of restoring health, prolonging life, and preventing many evils. I do not know of any medical book that has done a deeper or more needed work of reform.

In the recent years that have glided away so swiftly I have not been idle. I have published two volumes of "THE HERALD OF HEALTH" (July, 1875, to July, 1877), full of matter relating to Sanitary and Social Science, which are bound up compactly, and may be read with profit, I hope, for years to come. I have also published a book on "SOCIAL LIFE"—a book of manners and morals which I thought might be useful to a large class of the young people of England rising by their own efforts, and the means of education now provided, to higher spheres of thought and life. This book (first published under the somewhat misleading title of "Behaviour") is, in my opinion, one of the best and most practically useful of all I have written, and this is also the opinion of many other

The little book, "How to Live on Sixpence a-Day," published in 1871, was the beginning—"the thin end of the wedge"—of all my sanitary work in England. "How to Cook" is a compilation, with a few original chapters, which I thought might be not only a useful general cookery book, but a help to those who wished to reform, more or less, their diet. "Count Rumford" gives a brief biography of a great reformer, and tells how he banished beggary from Bavaria.

As I write these lines, I am sending to the printer the last pages of a shilling pamphlet on The Diet Cure, which I hope may teach many thousands the science and art of "Eating to Live," instead of "Living to Eat," and thereby eating to live in misery and die before their time. As bad food and drink are among the most prevalent causes of disease and death, it follows that a good diet may secure health and longevity. Pure food makes pure blood—pure blood builds up a healthy body. The secret of health is in "The Diet Cure."

And I have promised to have ready before the Christmas of 1877 one other little book—a pretty volume, bound in cloth, for a shilling—a book of human physiology, and specially of sexual physiology, for children of tender years and of both sexes—a book which every father can give to his son, and which every mother can give to her daughter—"A Beacon Light" which will warn them of the dangers that beset the path of life. For years I have been

entreated to write such a book It is a work of great delicacy and responsibility. In my lectures on Physiology, given to men and women, sometimes separately, sometimes together, I have *felt* my way to this work. I have seen how it can be done with the least risk of evil, and the greatest hope of good. Of its character and fitness every parent can judge. The father, when he has read my "Beacon Light," will see whether he can give it to his darling boy to read; the mother will feel at once whether she can place it in the hands of her daughter, innocent and pure, for whom innocence and purity may not, in the absence of some timely warning, shield from evils that may bring disease and death.

In the advocacy of Sanitary and Social Reform I have not been content to merely w'te my books, and let them do their work. A reformation of habits, morals, and health is an uphill work. Men are prone to evil. Luxury and vice, immorality and depravity, disease and death, all come easily—spontaneously. They are downhill work. *Facili descensus averni.* People blunder helplessly into wrong ways, and pitfalls, and quagmires, and they need to be shown the safe paths, and aided to ascend to the heights of a pure and noble life. I have tried in many ways to give such help. I joined business to authorship, and experimented and invented, as well as lectured and wrote. I have been compelled, also, to receive consultations, and have not been able to entirely refuse, at our country house at Malvern, to receive patients for cure.

What seemed more important was to establish in the centre of London a Sanitary Depot, for the sale of Hygienic Books and Appliances, with its branch establishments in many of the principal towns, from which people can purchase or order pure foods, as the "Food of Health," "Wheaten Groats," "Self-Raising Whole Wheat Meal," Dried Fruits, etc., etc., Portable Turco-Russian Bath, Portable Fountain Bath, Mills for Grinding Corn, Filters for Purifying Water, and whatever may be needed to carry out practically the advice given in my books. In all this work I have had the efficient help of honourable and faithful men and women—most of all, the wise counsel and loving help of one who has given her whole life to the work of Sanitary Reform, and to whom the world is indebted far more than in this world it can ever know.

MALVERN, *October*, 1877.